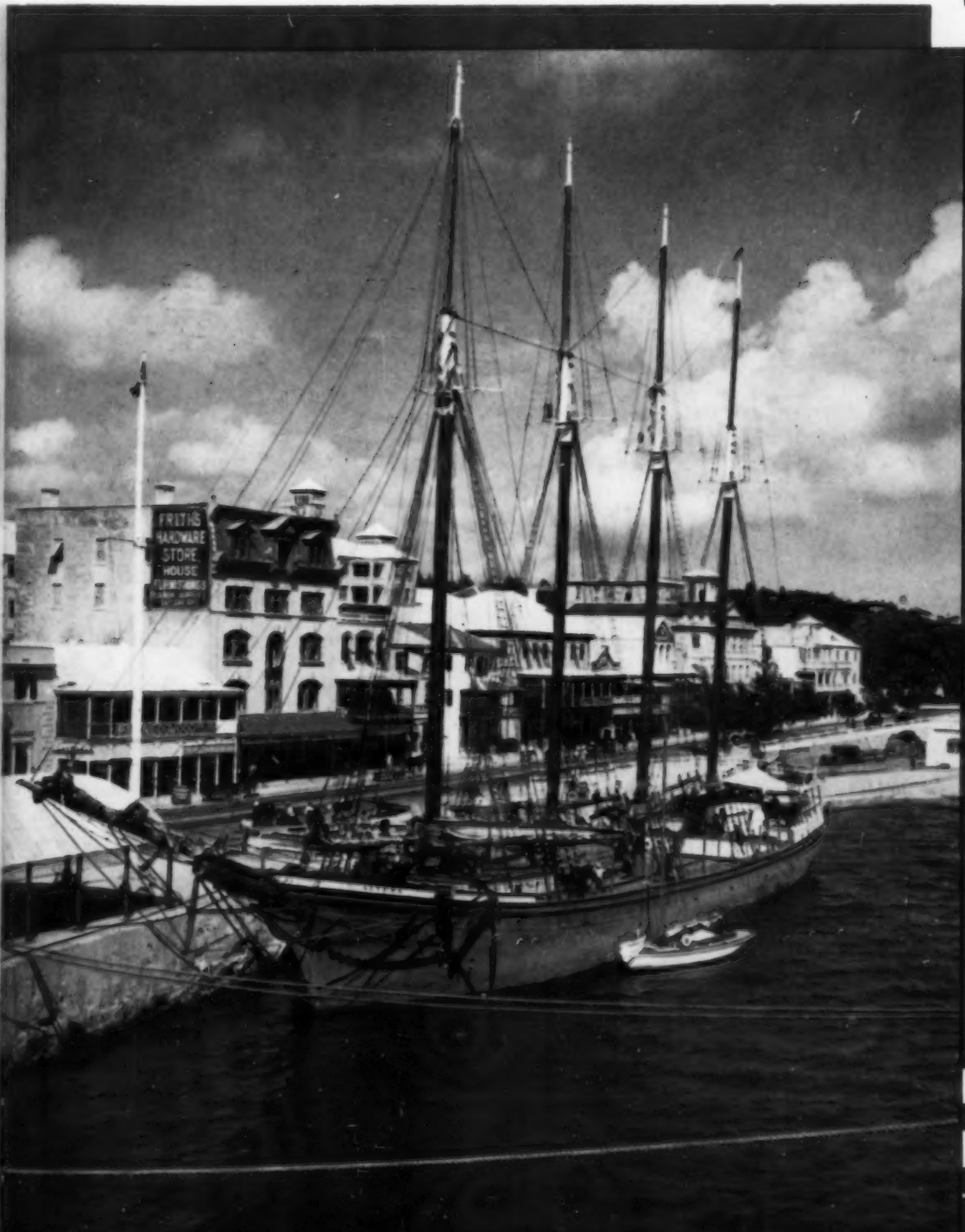
CANADIAN GEOGRAPHICAL JOURNAL

NOVEMBER
1938

VOL. XVII
NO. 5



35c A COPY

$3.00 A YEAR

Drive the new 1939

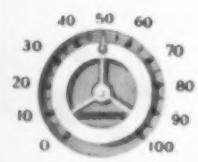
Plymouth

New 1939 Plymouth Four-Door Streamline Sedan

SO BEAUTIFUL YOU WON'T BELIEVE IT'S STILL A LOW-PRICED CAR!

VALUE IS UP, Price is Down . . . New Plymouth Gives you Lavish New Luxury . . . Longer Wheelbase . . . New High-Torque Engine Performance with New Economy . . . New Handy-Control Gear Shifting . . . New Auto-Mesh Transmission . . . New Amola Steel Coil Springs . . . New True-Steady Steering . . . New "Safety Signal" Speedometer.

Up to 30 miles an hour the light on the Speedometer Needle shows green . . . 30 to 50 m.p.h. amber . . . from 50 m. p. h. a warning red!



HERE are the most beautiful, most luxurious Plymouth motor cars that Chrysler has ever built:

At New Lower Prices Plymouth brings you magnificent new styling—sweeping, modern lines . . . extra room . . . luxurious new upholstery. And the 1939 Plymouth has *a new ride* that will delight you.

With its new Amola steel coil springs and airplane-type, double-action Hydraulic Shock Absorbers, the big new Plymouth gives you a smooth, restful ride on even the roughest roads. New True-Steady Steering produces a new driving "feel" of confident control.

You'll get a thrill from Plymouth's new High-Torque engine performance. And yet the 1939 Plymouth is *still more economical* in every way.

Your present car will probably represent a large proportion of the 1939 Plymouth's *new low delivered price* . . . balance in surprisingly low monthly instalments.

SEE and DRIVE a new 1939 Plymouth TODAY! Visit your nearest Chrysler-Plymouth dealer. He will be glad to put a 1939 Plymouth at your disposal.

Convenient Handy-Control Gear Shifting on Custom and De Luxe models.

A wonderful new ride on Amola Steel Coil Springs. Sturdily built to withstand the roughest roads.

NOW ON DISPLAY . . . AT NEW LOWER DELIVERED PRICES!

South shore of Bermuda.

David Knudsen.

CANADIAN GEOGRAPHICAL JOURNAL

Editor - Gordon M. Dallyn

172 WELLINGTON STREET, OTTAWA

This magazine is dedicated to the interpretation, in authentic and popular form, with extensive illustration, of geography in its widest sense, first of Canada, then of the rest of the British Commonwealth, and other parts of the world in which Canada has special interest.

Contents

NOVEMBER, 1938 VOLUME XVII No. 5

COVER SUBJECT:—Central Front Street, Hamilton, Bermuda, with training ship for naval cadets alongside the dock.—David Knudsen.

PAGE

THE BERMUDAS—IMPRESSIONS OF A CANADIAN, by THE EDITOR 217

Title for Pages 232 and 233 — From Gibb's Hill Lighthouse a visitor with map and field glasses may spend many profitable and delightful hours. A typical panoramic view overlooking the dockyard with the naval anchorage at Grassy Bay. In the distance may be seen the "Queen of Bermuda" seaward bound.—Constance Phillips.

CHILD OF THE MOUNTAINS, THE WATER OUZEL, by HARRIET GEITHMANN 241

TENQUILLE VALLEY AND SUN GOD MOUNTAIN, by J. J. PLOMMER . 245

CANADA'S ALUMINUM INDUSTRY, by E. V. N. KENNEDY 249

EDITOR'S NOTE BOOK V

AMONGST THE NEW BOOKS VI

• • • •

The British standard of spelling is adopted substantially as used by the Dominion Government and taught in most Canadian schools, the precise authority being the Oxford Dictionary as edited in 1929.

The Canadian Geographical Journal is printed in Canada by the Canadian Printing and Lithographing Company, Limited, Montreal, for the proprietors, The Canadian Geographical Society, and published by the Society at 2151 Ontario Street East, Montreal, Canada.

Address all communications regarding change of address, non-delivery of Journal, etc., to the publication office, 2151 Ontario Street, East, Montreal, Canada, giving old and new address. On all new memberships, the expiry date will be printed on wrapper containing starting number. This will constitute a receipt for subscription.

Member Audit Bureau of Circulations.

Membership fee is $3.00 per year in Canada and other parts of the British Empire, which includes delivery of the Journal, postpaid; in United States, Mexico, France, Spain, Central and South America, $3.50; in other countries, $4.00. Make membership fee payable at par in Ottawa.

Sole Trade Agents for the British Isles: George Philip & Son, Ltd., 32 Fleet Street, London, E.C. 4.

Entered as second-class matter at the Post Office, Montreal, Canada.

St. George's

Constance Phillips.

THE BERMUDAS

Impressions of a Canadian

by The Editor

St. Peter's Church located on the main street of St. George's occupies the most ancient English Church site in the western world: The ancient altar table made of native red cedar was in use as long ago as 1624.

FOUR delightful days and a night had passed since the "Lady Somers" gently severed the gala ribbons and the tiny tugs had turned her bow from the Montreal berth downstream—on her non-stop voyage Bermuda bound. Four days had passed since the afternoon had brought the packet from Father Point, and three since the majestic shores of the mighty St. Lawrence had been left behind; the open sea lay before us with the personal attendance of spouting whales, romping porpoises and the flash of flying fish. And then in the early morning of the fifth day land was sighted, early morning with a brisk breeze, when through the rigging, sun-bathed Bermuda came upon us, a jewelled crown set in turquoise—a deep hush paid silent tribute to her beauty. Suddenly to starboard a tender appeared, the indispensable pilot grasping the rope-ladder climbed aboard and by circuitous route led us safely into harbour; each turn, each bend a new adventure, a new world to a Canadian visitor. Old world history long forgotten was recalled.

The land-surface of the Bermudas consists of a long narrow main island, with smaller islands contiguous to it at each end, irregularly oblong in shape and sheltering in the enclosed sounds the numerous small islands varying in size from a few acres to barren rocks. These are anywhere from 150 to 365 in number—some of the smaller formations are visible only at low tide which adds to the indefiniteness of the count and the lack of agreement among writers on the subject. Whatever the number, there are five which are of importance, connected with one another by bridges or ferry. The area of the whole group is about 19½ square miles with a curving drive of 23 miles, hardly a mile wide in some places and never more than two in any part. These "leafy isles upon the ocean thrown like studs of emerald o'er a silver zone", to quote the poet Moore, are probably the most isolated islands in the world, if we except St. Helena, being 568 nautical miles from Cape Hatteras the nearest land. Opposite Charleston in the Atlantic, they are 666 miles from the New York Lightship, some 688 miles from Boston, Massachusetts, 720 miles from Halifax, Nova Scotia, and 1,549 miles from Montreal, Quebec.

Of the islands those of chief interest are Hamilton, or the main island, thirteen miles long, where the fair white capital of the Colony nestles in the snug harbour that is Hamilton; St. George's, seat of the ancient capital, and full of mementoes of times long past, connected with the mainland by the causeway built 1871; St. David's with its old world atmosphere and quiet charm; Somerset once the old "Somer's seate" now an important centre of population, united to the mainland by Somerset bridge and the railway bridge; and Ireland Island, the headquarters of the British Navy in the North Atlantic. A magnificent floating dock put in place in 1905 and capable of raising a ship of 17,500 tons, is in constant use; a huge figure of an early Victorian warship, mute reminder of the past, is of interest to the visitor here.

The islands of Bermuda are the peaks of a sub-marine mountain range, relic of early ages, volcanic in origin, as was discovered some years ago when in the process of boring for water the workers penetrated the limestone cap which was found to be resting on volcanic rock. Beneath the layers of Æolian limestone is a layer of decomposed volcanic rock superimposed on the lonely shaft, the only one in this part of the Atlantic. The work of the coral insect and exposure through geological ages to wind, sun and the action of weather has resulted in the unique group of islands which we know as the Bermudas. The volcanic origin need not worry even the most timid of visitors, however, as there is no record of any disturbance of modern times, and the volcano which caused its birth lies at least a million years in the past; strangely enough the surface shows no trace of any volcanic agency, and it is generally believed that the coral insect has never been found so far north as in these islands.

The islands have been subject to alternate uplifts and depressions, and there is evidence of a recent depression in the presence of upstanding trunks of junipers found on dredging 45 feet below sea-level, and in the stalactites rising through thirty feet of water in some of the beautiful limestone caverns which are numerous at the north-east end of the main island and have been caused by the slow disintegration of the more soluble parts by the action of rain water. On the surface the eroding of the limestone has been uneven, causing the picturesque cliffs which are such a feature of the Bermuda landscape.

The mountains beneath the water are much greater in area than the exposed land, and higher peaks stick out in dangerous reefs and shoals on the north and west; approach through the narrow channel is possible only in daylight. These outlying rocks form a natural barrier some eight or nine miles out, and have been of supreme importance in Bermuda's history; its romantic story being inextricably intertwined with that of early wrecks and buried treasure, of ancient ships which suffered disaster on its inhospitable shores; conversely its protecting barrier has made the islands valuable to Great Britain as a fortress and naval base.

To-day it is the haunt and Mecca of the biologist, the geologist and botanist, as well as of the artist and traveller, each of whom finds fulfilment of his dreams in the peculiar composition and creation of the islands.

The date of the discovery of Bermuda has never been definitely ascertained. Such information probably lies buried with the wreckage of early Spanish galleons, whose commanders we know, used the islands as a landmark on their way home to Spain, and who often must have suffered shipwreck through their ignorance of the rocky coast. Early geographers give the date as far back as 1503; at any rate a book published in 1511 contains a map showing an island called "La Bermuda" which apparently had been named after someone called "Bermuda". This would seem to point to Juan de Bermudez, who in 1526 wrote a story of a voyage around the island of Bermuda in which narrative undoubted signs appear of an earlier

knowledge of the island. In 1527, Hernando Camelo offered to form a settlement, but this offer apparently did not result in anything as history records no evidence of his making use of his grant. Up until the year 1936, however, a rock on the south shore of the mainland bore deeply-cut letters and a date—1543—of undeniable antiquity, which might have had reference to the landing of this same explorer, Hernando Camelo. Unfortunately by 1937 this inscription had entirely disappeared from the rock on which it had stood for centuries; modern attempts to ensure its safety by covering in glass having proved its undoing.

Old superstitions and fears kept the islands in obscurity until in 1593 a French ship on which was an Englishman, Henry May, suffered disaster. May subsequently wrote an account of his experiences.

A modern instance of wreckage and one of interest to visitors to-day is that of the Spanish S.S. "Cristobal Colon" in October, 1936, on a voyage from Cardiff, Wales, to Mexico. The Spanish civil war, which was reputedly a factor in the disaster, caused a problem to the authorities also with regard to the return of the crew of one hundred and seven men and six women. Finally sent to France by a British steamer, the captain was later found to have been guilty of negligence, and the wireless operator of listening to instructions from "Madrid" rather than to wireless warnings. To-day the confusion and disorder of the cabins, havoc everywhere, make vivid the scene of hurried flight.

It remained for Sir George Somers in 1609 to raise the oblivion which had again wrapped the Bermudas following May's visit sixteen years before. In this year, which was to become one of supreme importance to the islands, left alone in their "disrepute", a fleet of seven ships and two pinnaces set sail for the new colony of Virginia, the settlement of which in 1585, had failed. The flagship, "Sea Venture" carried the Admiral, Sir George Somers. Due to storm and the springing of a leak, the little expedition was wrecked on the dreaded Bermudas, and from this event dates the habitation of the island. The unwilling visitors found the region swarming with wild pigs and fowl and the waters rich in fish. In due time the company set out again for their first goal, Virginia, but Somers returning for fresh food supplies died in Bermuda where his heart lies buried; a marble memorial now marks the spot in Somers Gardens. On the return of the survivors of the expedition to England a company of fifty settlers were sent out to Bermuda in 1612 under the command of Richard Moore, a ship's carpenter, and were welcomed to the island by three men who had been left behind by Somers. These men have been made famous by Washington Irving in his "The Three Kings of Bermuda". Governor Moore built fortifications and laid the foundations of the town of St. George's.

In the early years of the settlement numerous changes in control took place from one company to another and to the Crown, which in 1615 granted a charter to—The Bermuda Company. Under this monopoly the settlers were given a certain measure of self-government. In 1620 the first general assembly was held under Captain Nathaniel Butler at St. George's. But in 1684 the arbitrary actions of the company and their disregard of the people's rights and the laws of the little colony reached the ears of the King who forthwith deprived them of their charter which once more reverted to the Crown; Bermuda became a colony of the British Empire with authority vested in its own Legislative Assembly and such it remains to-day.

In the struggle between the Commons and King Charles I, Bermuda took the side of the King and was in a state of rebellion for a short period, finally surrendering to the Commonwealth. But the later return of the monarchy was received with joy by the colonists. Slaves, of which the settlement had a number, were freed in 1834, following the passing of the act abolishing slaves in England. Later, convicts were sent out to the islands to work as labourers on the Navy Work's Yard, taking the place of the former slaves, but at no time could Bermuda be termed a convict settlement. The convicts lived on board ships anchored outside, and when the

labour ended all the surviving convicts with one exception were taken back to England. Other prisoners which the colony fortress sheltered from time to time fall into a different category, having been prisoners of war or rebels, exiled by the Mother Country—for political reasons.

The year 1842 recorded another milestone in Bermuda's history when the first steamship of the Royal Mail Line arrived off the coast, thus inaugurating steamship communication, which has proved to be a most important factor in the subsequent prosperity of the no longer isolated spot.

Space does not permit of more than a cursory glance at the early story of this romantic outpost, but it is safe to say that these little coral islands far out in the lonely Atlantic Ocean have embodied in their history much of the political, religious and economic life with their changes, which were taking place in the distant mother island of England at about the same time. To-day the colony, self-governing, strongly independent, has the same loyal attachment to the Mother Country as was its strength in the past. Its traditions have been born in the long-ago and are unbreakable.

As we have seen under the old Bermuda Company, the constitution of the colony granted a reasonable amount of self-government including the right to elect representatives within certain limits. When control passed to the King, the same type of government as prevailed in England in the 17th century was retained, and such it remains to-day with but a few minor changes necessitated by local conditions. There is a legislature composed of a Governor assisted by an Executive Council of four official and three unofficial members, a Legislative Council of nine members of whom three are ex-officio and a House of Assembly with thirty-six members, four from each of the nine parishes. The Assembly is non-party and the two Councils are appointed by the Crown.

A land of colour and contrast, of white sand on the beaches and red soil in the valleys, of green cedars with low white houses peeping through, of tall cliffs guarding the silver water of sandy bays, the clear transparent depths of which are teeming with life, old and new. And over all the soft elusive blue of the sky. A land where "each wooded island sheds so soft a green".

The houses, low, dignified in proportion and line are predominantly white or of pale pastel shades, necessarily so because the citizens of Bermuda are dependent on the skies for their drinking water, and the roofs of the houses are always built as catchments for the rainfall; cleanliness is therefore a first essential and whitewashing a frequent occurrence, adding considerably to the beauty and well-groomed appearance of the country-side. The prevalence of coral limestone affords a building material close at hand, in truth, it may very readily be carved out of the ground by anyone with an ordinary saw, but in most cases the builder procures what he requires in suitable blocks from the quarries.

The roads are of coral rock, winding through picturesque country unmarred by fences; where necessary, stone walls—many of them dating from a much earlier period—take their place. Trees clothe the hillsides and wild flowers line the roadway, flowers which the visitor from the colder countries knows only as the denizens of the hot-house and florist shop.

The Gulf Stream sweeping from west to east, to the north of the islands is largely responsible for the mildness of the climate, ameliorating the cold north-easterly winds; and the wise folk may share Bermuda's bounty of moderate temperature, sea breezes and clear air with perfect comfort, ease and contentment. More restless souls with their foreign urge to see and do will suffer—as they do at home. Bermuda in summer must be taken in the tranquil spirit that is the atmosphere of the island and her people. The mean temperature varies from 63°F. in January to 80°F. in July. The rainfall of about 60 inches is distributed through the year with December generally the wettest month. Persistent rainfall however is unusual and heavy showers are followed by warm sunshine. Frost is unknown.

A familiar sight on the main street of Hamilton, Bermuda, where probably the most completely equipped bicycles in the world take the place of the motor car.

Constance Phillips

The time of greatest bloom follows the winter months, but colourful tropical bloom adorns the roadside in midsummer and the familiar flowers of Canada may be found in the gardens. Gorgeous oleanders, white, pink shading to red and deep crimson adorn the hedges, and big purple flowers of the Morning-Glory may be seen throughout the year. The flora of these islands is a study in itself; botanical records exist as far back as 1624. Since that time species introduced and naturalized greatly outnumber the endemic plants.

The bicycles are British, the currency bears the British insignia and British too is the tongue of old and young of whatever stock, of whatever race or colour. Yet it remained for the annual classic cricket match to place the indelible stamp of Britain on the Bermudians; it was with a glow of ancestral pride that seated beside the president of the losing team I heard his hearty "Well played, Sir!", "Well played, Sir!", to plays which meant the passing of the championship. It was with equal pride I witnessed the fraternizing of victor and vanquished, supporters and players alike when the last wicket had fallen.

Bermuda has a population of somewhat over 30,000, of which 18,500 odd are coloured. The latter are descendants of the one-time slaves for the most part, with some immigrants from the West Indies; the white people are mostly of ancient colonial stock and tradition.

There is no income tax, death or inheritance tax and very few other taxes of any importance. The land is owned by a relatively small number of people, and as ownership of land among the males is the one qualification for the voter, comparatively few persons share the franchise, or about 10 per cent. While the transient tourist is welcomed to the islands, anyone desirous of buying property must

The lighthouse at the eastern end of St. David's Island is a picturesque stone structure standing 208 feet above sea level and commanding excellent views both east and west.

apply to the Governor-in-Council; the names of the applicants are then published in the press and enquiries set in motion, as aliens are permitted to own not more than 2,000 acres of the total 12,500 acres of land. Money alone is not the password for the prospective landowner.

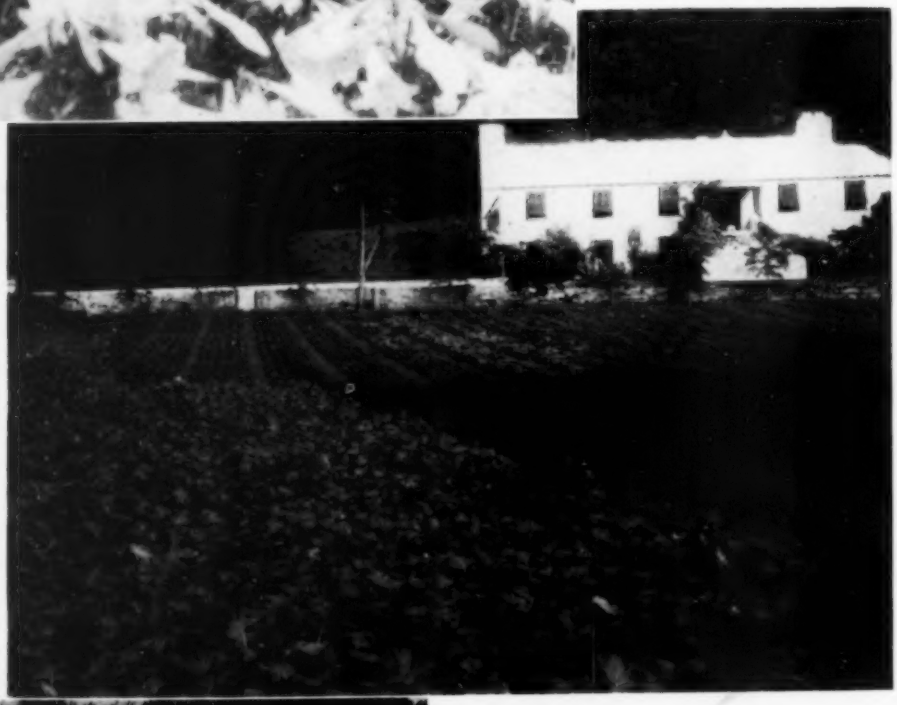
To one long familiar with surveys of Ontario's hinterlands, the reversion of land once producing agricultural crops to grass and bush invited explanation—a visit to the experimental farm proved illuminating. The Station dotted with experimental plots is inviting the interest of potential farmers back to the land. In these plots are tried varieties of early vegetables and new seedling lilies which have been raised in the hope of finding a more perfect Bermuda lily. The Black-stemmed Takesima is the established lily of commerce and it seems to offer the main hope of really large quantities of Bermuda bulbs. Regular systematic inspections are made by the Department of Agriculture to uphold the reputation gained by Bermuda lily bulbs for high quality, trueness to type, and freedom from disease.

The increasing tourist trade is providing a market at Bermuda's backdoor, for which the local supply of foodstuffs is quite inadequate. Many experiments are under way to take full advantage of modern agricultural science. The pathologist and the entomologist are making progress in the eradication of disease, and insect pests, and potential forests are being established. Bermuda's concentrated acreage demands the right use of land.

Bermuda is principally an importing country with the United Kingdom, the United States and Canada, enjoying the bulk of an import trade which in 1937 amounted to over ten and a half million dollars, of which Canada participated to the extent of 14.5 per cent. Of particular interest to Canadian visitors is the fact that

Gibb's Hill Lighthouse has served the mariners since 1846. A monument of British workmanship its half-million candle power beam is visible 28 miles on a clear night. From the staunch observation gallery 116 feet from the hill-top and 362 feet above sea level the observer commands a panoramic view of practically the entire group of islands which constitute The Bermudas.

Children in the lily fields.



A Bermuda farm as it appears in February.—C.N.S.

"Lilies of the Field".
—David Knudsen.

Preparing early celery for the home and export markets—David Knudsen.

Harvesting sweet potatoes in early spring.—C.N.S.

Lily field in the midst of Bermuda cedars. St. David's Lighthouse in the background. —David Knudsen.

Governor Moore—Bermuda's first governor, 1612-1615, built or laid the foundation of a number of forts.—David Knudsen.

Canadian oats, hay and flour are used almost exclusively in Bermuda, holding 97 per cent of the market, while pickled fish, Irish potatoes, canned vegetables, bran and cheese range from seven to nine-tenths of the total trade.

Of Canadian products imported, food supplies head the list with $762.546. Agricultural supplies rank second with $316,114, and building material third with $113.967; while house furnishings, clothing, electrical supplies, drugs, transport and domestic animals follow in the order given. The importance attached to this trade by Canadians is indicated by the fact that there are over one hundred Canadian agencies established in Bermuda.

The principal commodities exported are early vegetables, onions, potatoes, lily bulbs and cut flowers which find almost their total market in Canada and the United States. The present export trade of Bermuda, though but 25 per cent of pre-1929 days, possesses potentialities for substantial improvement. Remedial measures being undertaken, include provision for more adequate pre-cooling and cold storage facilities, in order to insure delivery of commodities in first class salable condition, sufficiently attractive to successfully meet keen competition and to minimize present heavy losses in spoilt goods.

The Bermuda Trade Development Board was constituted by Act of Parliament in 1913 to administer such grants as should be made from time to time for the development of the trade of the islands. At that time the islands enjoyed a lucrative, agricultural export trade with the United States, and one of the principal duties of the Board was to provide adequate transportation facilities for the shipment of agricultural produce from Bermuda to the port of New York. Of secondary importance was the fostering of a growing tourist trade. But times have changed; Bermuda's prosperity is now determined by her tourist trade which, under the initiative of the Board and the islands' intrinsic merits for the traveller seeking repose from a hectic office world, was valued in terms of crude currency, in 1936, at £1,682,655.

Bermuda is either the terminus or port of call for five steamship lines providing

Native, sawing coral limestone blocks.—C.N.S.

service from Montreal during the summer, and Halifax and Saint John, New Brunswick, all the year. Other services include Boston, New York, Liverpool via French ports, and British West Indies. Canadian visitors in 1937 numbered 2,900 of a total estimate of 80,000.

To those who would recapture the atmosphere of a previous generation, to those who desire to enter the world of contemplation midst idealistic surroundings Bermuda offers a unique refuge.

Seated at my window, I feel the mellow sounds of yesterday permeating the atmosphere; the distant trot-trot-trot of the horse and the familar rattle of the democrat on the random stone, the cheerful chug-chug-chug of the water pump, the distant crow of roosters bring back the farm, the old stone road of boyhood days. A patter of rain, and almost ere it reaches consciousness it is gone and in its wake the pungent aroma of new mown hay and garden flowers. The cooing of Ground Doves pleasantly accompanies the obligato of the Cardinal Grosbeak; and as evening approaches, the stars gradually emerge one by one to form a galaxy of light and beauty. It is the signal for the crickets, and the nightly orchestra accompanies the deep bass of the tree-frogs. From the distance comes the note of the guitar and happy chorus of the coloured folk punctuated by merry laughter.

"Oh! could you view the scenery dear,
That now beneath my window lies,
You'd think that Nature lavished here
Her purest wave, her softest skies."
Moore

Many years ago in Edinburgh a young lad expounded to me at some length on the history and background of Edinburgh and Edinburgh Castle. I was captivated by his knowledge and the excellence of his Scottish tongue. The experience lingers with me never to be forgotten. Bermuda recalled it strongly.

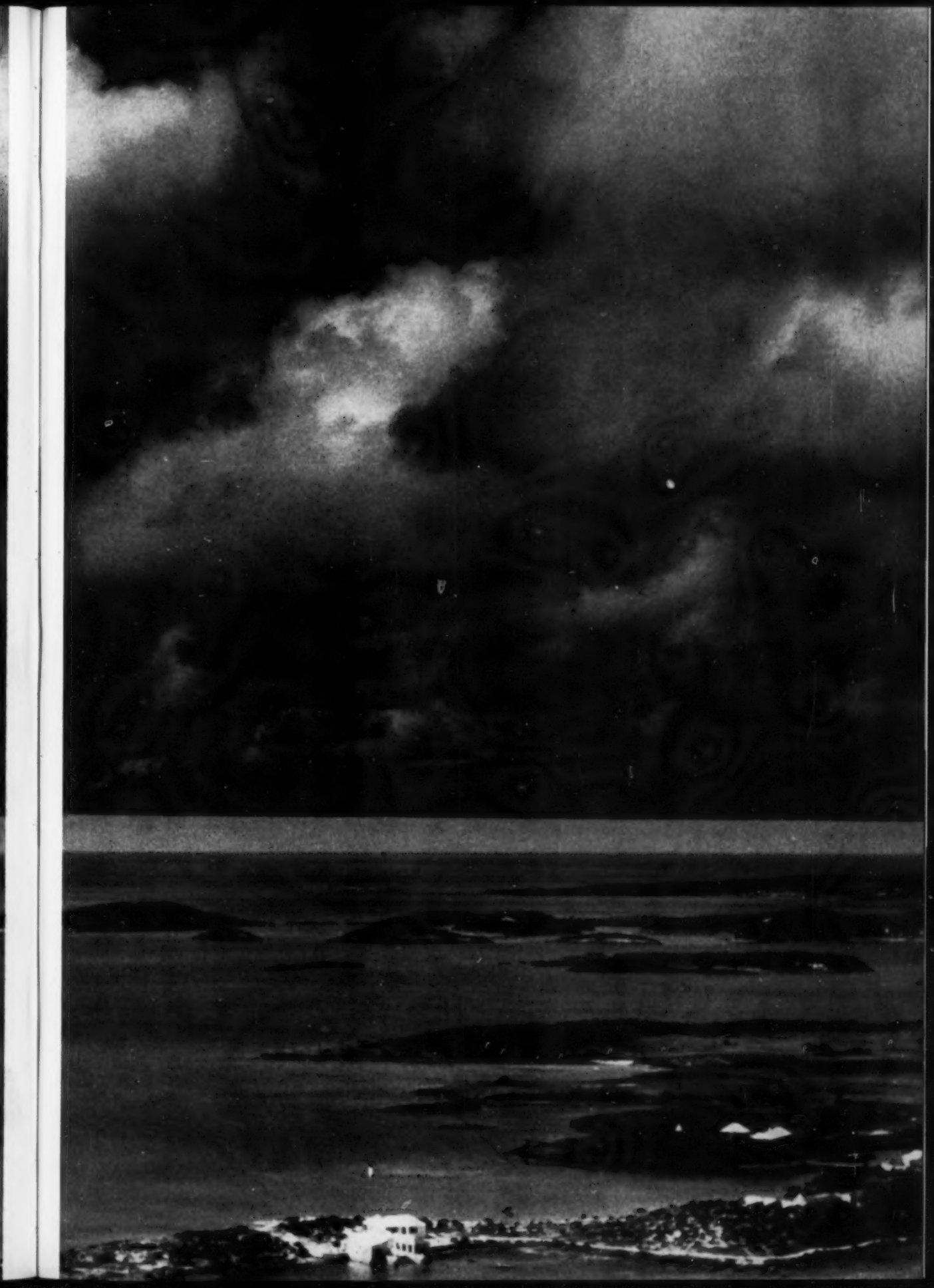
The absence of both the accent usually imputed to the coloured race and of "American" slang is noteworthy. Clear diction, pleasant tones are common alike to a cab-driver, caddy and the little folk

one meets on the road. Sunday is a special day of community gatherings, of family groups happily chatting as they bicycle their tranquil way to some quiet, exclusive retreat by the seaside, later to enter their selected caves to prepare for the never-ceasing lure of the sea.

Mixed groups of coloured folk each in spotless and attractive garb blend harmoniously with the Bermudian landscape. The noise and whirl, the rushing pace, the intent, introspective eye are absent. The prevailing tone throughout is one of tranquillity, quiet enjoyment and philosophical contentment; and this individuality the legislators of Bermuda are determined to conserve.

* * *

One hour had passed since the tender had left our dock, one short half-hour since our weighing-in; a few brief minutes since we had crossed the harbour, glimpsing the church spires resplendent in the newborn sun; a moment since at the admonition, "keep your seats!" the purring quadruple motors had sprung to tumultuous life. The "Cavalier" raced across the bay blurring the shoreline, a gentle tilt and the silver bay receded as we soared and circled. Familiar landmarks assumed new aspects; farms and dwellings took on the familiar patch-work quilt pattern, and our jewelled crown assumed a new figure of even more arresting design and beauty. The under-sea coral reefs of Bermuda appeared as floating jetsam and a new world was upon us. Up, up, until the rolling seas two miles beneath were flecks of down. Truly we had brushed Aladdin's lamp; banks of cumulus clouds bordered our way as we, unconscious of time, sped onward amid ever changing worlds of ethereal beauty. Billowy clouds of fantastic mould mirrored their darker like in the glazed sea; before us, one of darker hue, greeted our coming with a "bump" and quickly passed, revealed a double rainbow full-circled beneath us. Unknown to us our navigator skirted the storm clouds, and far below our ship we saw the giant "Queen of Bermuda" two days out from New York, a tiny toy, white fringed, a trailing streamer of blue at her stern. The balmy breezes of Bermuda were five hours away as we entered a muggy New York — Canada bound.



Intimate glimpses of Bermuda's homes and gardens and one of its many snug harbours.—David Knudsen.

A familiar road scene.—C.N.S.

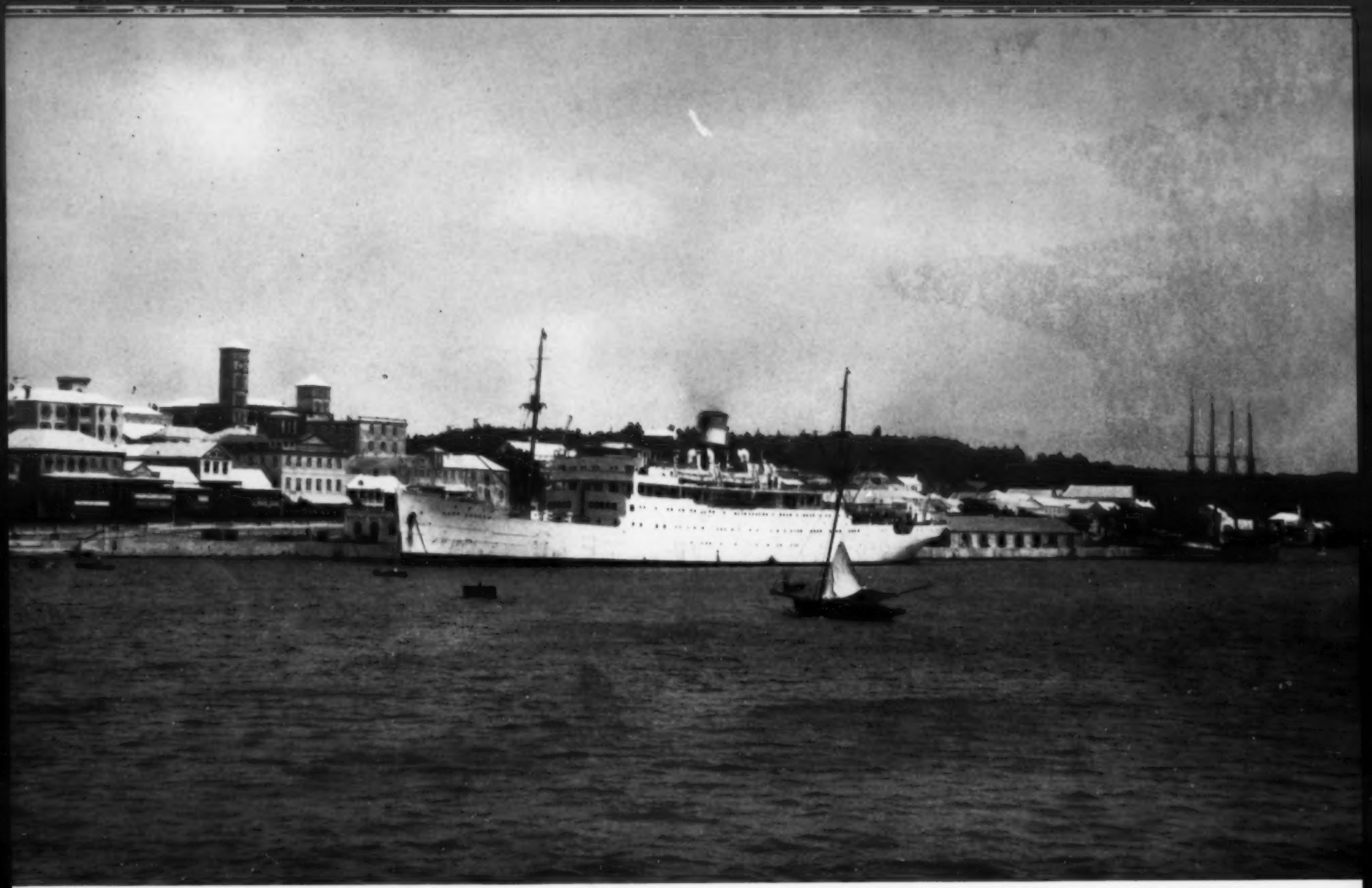
Ancient ruins at St. George's—S. J. Hayward.

St. George's looking east from
Rose Hill. — David Knudsen.

A typical home and surroundings.—David Knudsen.

Nature's artistry—a striking cave formation. — S. J. Hayward.

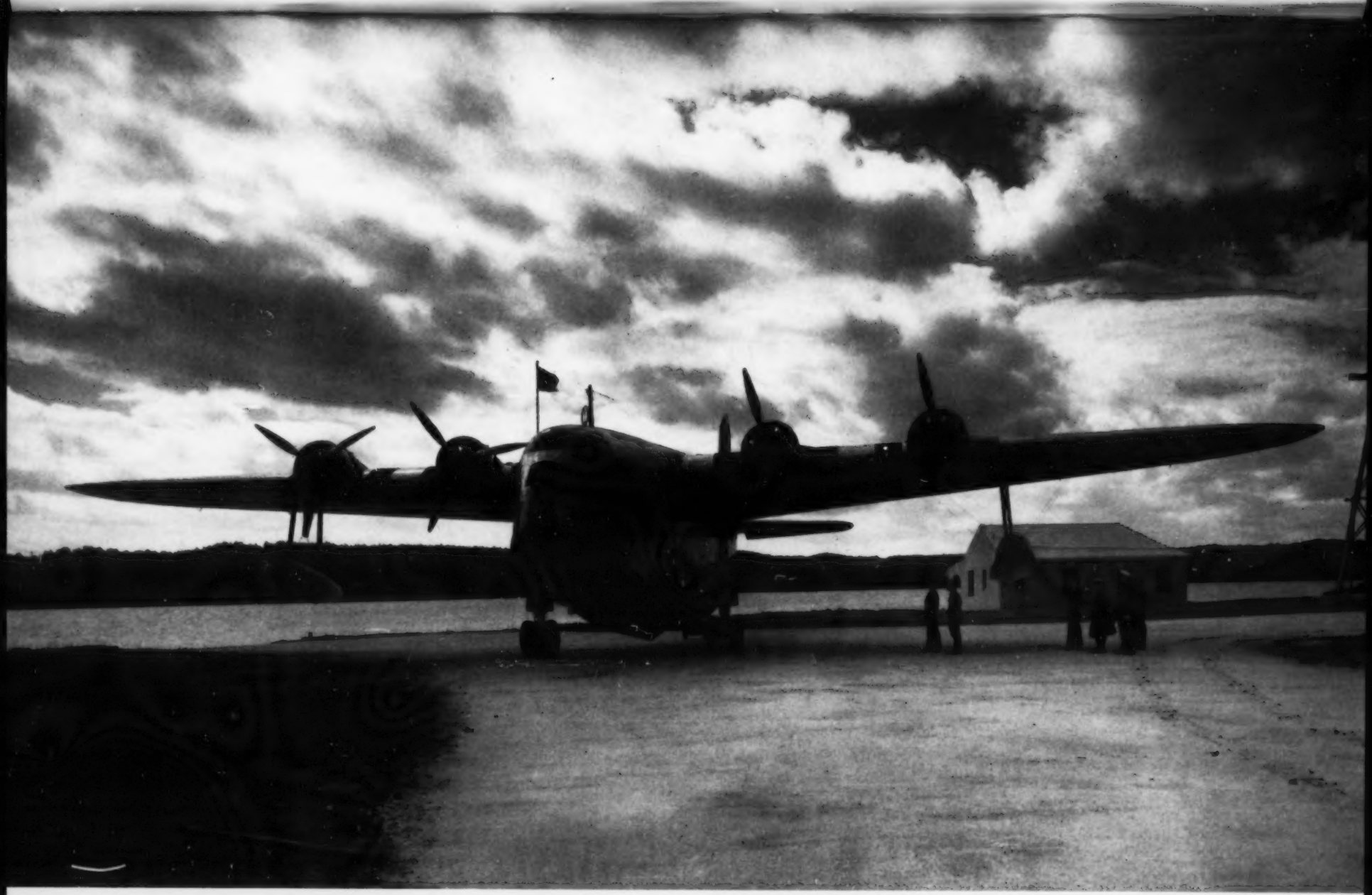
Hamilton Harbour. — C.N.S.



Ships from all parts of the world may be seen in Hamilton Harbour. S. S. "Lady Somers" just docked from Canada.

Canadian National Steamships

Ships from all parts of the world may be seen in Hamilton Harbour. S. S. "Lady Somers" just docked from Canada.



The "Cavalier" one of Imperial Airways Empire class flying boats which with a crew complement of five operates between Bermuda and the United States. Weighing approximately 18 tons this ship has a maximum speed of 200 miles per hour and a passenger capacity of 24. — David Knudsen.

CHILD OF THE MOUTAINS, THE WATER OUZEL

by **HARRIET GEITHMANN**

IN all birdland, extending from the Himalayas to the Rockies, it would be hard to find a more eccentric individual than the water ouzel, bird of foam and spray, spirit of mountain streams. Though he belongs to the Old World and the New and has ranged over five continents for literally millions of years he plays the game of solitaire so wisely and so well that comparatively few people know of him or his daring habits of life. Those few who do, love him. They are the venturesome folks who leave the placid lakes and rivers behind and visit Alpine meadows and rugged canyons where rollicking streams, not too far from their original snowy sources, are rushing pell-mell toward the sea.

On the western slopes of the North American continent where the water ouzel ranges freely from Alaska to New Mexico, he is also known as the American Dipper. His scientific name is *Cinclus mexicanus* and Cinclus in the Greek means "wagtail". Perhaps his ancient Anglo Saxon name of water ouzel suits him best of all for he actually oozes through the water, frigid, foamy or otherwise, in a perpetual ecstasy of delight. This merry little water-thrush does not claim to be a typical water bird and commands neither the webbed feet of the swimmer nor the long legs of the wader. Neither is he a land-lubber. Rarely does he migrate far from his own allotted territory, a stretch of stream which he patrols regularly as any faithful homesteader. Neither does he venture downstream until his own section freezes over so completely that he cannot find even a churning air hole in which to take a dip. On the very fringe of torrential water this blithe and buoyant citizen of birdland makes his home and forages for a living.

His daily fare consists of aquatic insects, the larvae of the shad-fly, the dragon-fly, tiny crustaceans and the caddis-grub, wriggling water life. If now and then he captures a minnow for his offspring who is there to say him nay? The half-fledged water ouzel must be fed and it is rumoured that he can easily swallow a baby trout three inches long. However, the number of trout that the water ouzel catches will never threaten the conservation policy of any country. In this connection it is interesting to note that P. A. Taverner of the National Museum of Canada says, "Dippers are quite harmless except when under unnatural artificial conditions they occasionally congregate about trout hatcheries when they take an appreciable toll of the fry."

In earning this highly adventurous living, the water ouzel leads a picturesque career "advancing and prancing and glancing and dancing and dashing and flashing and splashing and clashing". His brave, little heart seems to be always singing "white water ahead". Gayly he trips down the black and dripping boulder and disappears into the foamy pool below only to reappear a short distance beyond with a juicy caddis-grub in his beak.

That he is a diver of fearless ability there is no doubt. When once beneath the surface of the pool or stream he appears to tread lightly along the pebbly bed with his head upstream, clinging to the stones with his sharp little claws until he finds his reward by prying and peering this way and that. That he paddles with his wings is also true but not on the surface of the water. The minute he stills those ever-fluttering wings he immediately bobs up to the surface as blithely as any cork. It is estimated that his little body is barely three-fourths the weight of water. Therefore it must take considerable effort on his part to remain below for any length of time. Like all thrushes, the water ouzel is characteristically a "walking" bird.

Chunky as a robin and about two-thirds as large, it would seem that his daring spirit is almost too big for that body of his. He wears a waterproof cloak of slaty black and muffler and cap of dusky brown. His eager bill which always is

Intimate glimpses of the water ouzel at home; on the flower bordered banks of his rollicking mountain stream (Centre); at the thundering cataract (Upper Inset); peering over a great boulder, in mid-stream, under which hangs her mossy home and ravenous family (Lower Inset).

Centre photo by Walter Hagenstein.

finding or carrying a juicy morsel is ebony black. Beneath this waterproof costume of his, he wears another suit of oily down which prevents the water from penetrating to his body. This suit is kept in perfect trim by reason of an oily gland above his stubby perpendicular tail. As further protection he wears a third eyelid, a translucent one called the "nictitating membrane". This extra lid which is visible when he winks, slides across the eye from the inner to the outer corner, but the white spot which shows is on the lower eyelid. It is a valuable addition to his upper and lower lids. Many water creatures have it as well as all birds. This little verse tells the story:

Did you ever see a Dipper wink ?
He does it as quick as you can think.
He bobs his head and bats his eye
And lets his nictitating membrane fly.

One of his quaintest habits and one that immediately tags him for the first time is his adorable little curtsy. Wherever he hesitates for a moment on rock or limb above the boiling waters, he curtsys to all the world, bending his little heels until one would think they would snap in two. His knee joints, hidden against the side of his body, are invisible externally. It is a true curtsy and not the nervous teeter of some water birds. This eternal dipping of his is responsible for his Dipper name.

Of all his characteristics, his song is his supreme achievement, a clear, silvery interpretation of the spirit of the stream on which he dwells, a song that links him with the thrushes. "He is the mountain stream's own darling," said John Muir, "the humming bird of blooming waters, loving rocky ripple slopes and sheets of foam, as a bee loves flowers,— as a lark loves sunshine and meadows." His voice is that of the crystal waters that have been but recently released by snowfields high, high, high. Bubbling with joy, this exquisite song of his is "infinitely organized, spiritualized". It reflects the "booming notes of the waterfalls, the trills of the rapids, the swirling and gurgling of pot-holes" as well as the "low hushes of levels". It blends with the stream of his adoption, and yet when one's ear is attuned it can be heard above the music of the current like the melody of a forest flute. While the water ouzel sings in every month of the year, in midwinter when the stream is at its boisterous best, then his song rises to its highest notes. In midsummer when the current ripples lazily over the pebbles, then the song ebbs in perfect harmony. An ancient Indian legend best describes the beauty of the water ouzel's song. Fleeing from their native tribes which were at war with each other, two Indian lovers went drifting down a mountain river all night long singing softly as they went, so softly that not even the leaves along the banks could hear. In the gray dusk of dawn as they swept over a perilous cataract, they implored the Great Spirit to save them. He heard their cries and transformed them into two dusky birds that flew out of the foam to a neighbouring boulder where they curtsied their joyous gratitude and sang their future allegiance to the mountain stream churning at their feet.

Perhaps another reason for their great exuberance of song in midwinter is the fact that this is the season for courtship. Then do they gambol in the air above their stream chasing one another in high delight and singing like skylarks. Surely Emerson's thought, "Life is an ecstasy", applies to the water ouzel.

Another unique achievement in the life of this singular bird is his nest which is one of the architectural wonders of all birdland. Bird lovers have been known to search diligently for the water ouzel's nest for twenty years or more, so cunnily are they hidden from friends and enemies alike. It was the good fortune of members of "The Mountaineers of Seattle" to find one last summer in Berkeley Park on the northern slopes of Mt. Rainier. In the very center of a rollicking stream that gushes right out of the meadow in beautiful Berkeley Park, a stream that is bordered on both sides by lupine, Indian paintbrush, mountain heliotrope and purple heather and flanked with Alpine firs, Alaskan cedars and rocky pinnacles towering overhead, we found the precious home of a water ouzel family, several half-fledged Dippers and the energetic parents.

The nest, which was a typical one, was located above a churning pool, under the lip of a black and mossy boulder. The entrance was but a wingbeat from the silver spray of tumbling waters. The nest was a ball of living moss about a foot in diameter and half a foot in depth. The doorway faced the onward rushing course of the stream and the purple canyon on ahead. It looked as though it had been chosen with an eye to view as well as to security. Over the threshold yawned the orange maws of the ravenous young fledg-

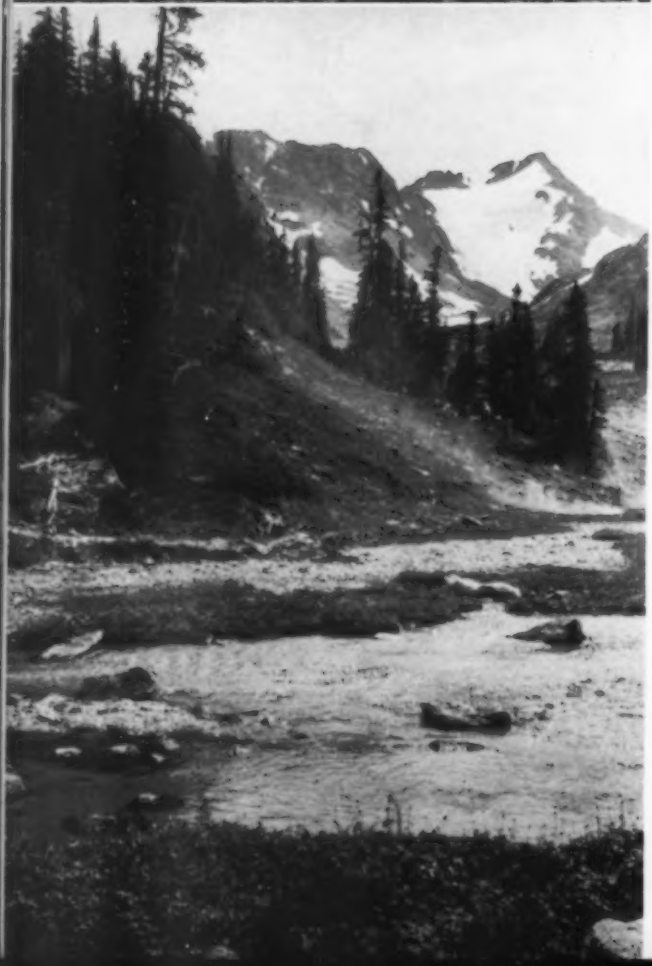
lings. Every time either parent appeared with a wriggling tidbit, he invariably dipped it in the water in order to serve his salad fresh like any first-class chef would do. The nestlings seemed to sense the approach of each parent in spite of the fact that the deafening roar of water made it almost impossible for us to hear one another shout. The birds did not seem to resent our presence. In groups that changed from hour to hour, we studied them from every angle on the rocky banks, and also took their pictures with the movie camera and kodaks right and left. The parents seemed to discuss the novel situation with each other as they foraged up and down the stream, but the sun of publicity which shone upon their intimate family life apparently did not disturb them overmuch. They displayed complete trust in the human family.

The water ouzel's nest is built with moss that is dipped in the water, fibre by fibre, during construction. The finished result is an interwoven globe of living, growing moss which is usually sprayed by the onward rushing stream. Within this globe which looks like an "old-fashioned Dutch oven" is a cosy dry nest of leaves, fine rootlets and soft mosses where four or five fragile eggs, white as foam, are laid sometime in March. If, perchance, the mossy nest is located under an overhanging tree or cleft in the bank where the spray of the stream will not reach it, then some of his good friends say that the water ouzel turns into an animated sprinkler and perches on the roof of his dwelling after every dip and sprays it with his wings. From the rim of this precarious cradle the young water ouzels take many a lesson in mastering the brawling stream at their feet.

No mortal who worships at the shrine of our twentieth century gods, Hurry and Worry, will ever really know the water ouzel. To get acquainted with this child of the mountains, one must cultivate long patience, choose the proper setting and then wait on the bank for the singer to appear on the stage. Presently he will come curtsying around the corner, usually alone, unless it be nesting time when a family is united in the common labour of love. In being thus alone he reminds one of John Burroughs' observation: "The finest spirits are not gregarious; they do not love a crowd. Crows and wolves go in flocks and packs, but the eagle and the lion are solitary in their habits."

The national parks and forests of Western United States and Canada are the surest places in which to find him at home among his templed crags. Along the Merced River in the Yosemite Valley even in midwinter one will find him bobbing in and out of the water, in and under the ice singing as he stops to curtsy from the black and shining rocks. To win the friendship of this independent child of the mountains, this lover of solitude, is one of the richest adventures in all birdland, whether one searches for him in the mountainous country of Colorado where he is called the state bird, or along the rollicking streams of the Pyrenees.

Surrounded by the rushing water of his selected stream the water ouzel partakes of a dainty bit of caddis-grub.
Alice M. Lyon.



TOP:—
Looking east along Ronayne Ridge to Sun God Mountain from the top of Copper Mound (7,050 feet). The figures are Messrs. Bain, Ronayne and Landsborough. The picture was taken early in August.

TOP LEFT:—
Sun God Mountain from Grizzly Pass.

LEFT:—
Attempts at mining have been made in Tenquille Valley. This photograph, taken at an altitude of 6,000 feet, shows the Gold King (Baker's) claim.

TENQUILLE VALLEY AND SUN GOD MOUNTAIN

by **J. J. PLOMMER**

ALL the mountain valleys of British Columbia are beautiful, but each in a distinctive way. This individuality cannot be altogether described. Some of these mountain areas are overpowering in magnificence, as in Garibaldi Park, where the flowery ways are flanked by jagged ridges and glaciers, and slope to an extensive lake. Other corners of the hills are quieter and more alluring. Tenquille is a happy medium. There are climbs sufficient to satisfy all except the most daring, but the country is not really difficult; and numerous trails, constructed to serve mining claims now abandoned, traverse the district. Most of these are still good for horses. Animal life is abundant, from rodents to grizzly bears, and the botanist, ornothologist, entomologist and geologist has plenty to study. It is therefore a naturalist's paradise. The number of birds is unusual for a valley of this elevation.

Tenquille is not more than a hundred miles from Vancouver as the crow flies, and an aeroplane could get there in short time. However, most of us do not travel that way, and some of us still enjoy more leisurely methods. The usual way is to leave Vancouver by boat at 9 a.m., and transfer to the Pacific Great Eastern Railway at Squamish in the early afternoon, arriving at Pemberton just in time for the evening meal. After that a fifteen-mile drive up the Lillooet Valley takes the traveller to the Ronayne Ranch, where he may roll up in the hay. In the morning, he may "hit the hills." It is a ten-mile walk to Tenquille Lake; and whether one takes all day or less depends upon one's physical condition. The highest point on the trail is 5,600 feet, attained, at the top of Wolverine Pass, from which the trail drops 400 feet to the lake. This is the ideal camp site and a good centre for operating in various directions.

Tenquille is a valley, but we now apply the name to the surrounding area. Tenquille Lake, at the head of the valley, is reached by proceeding eastward as described from the Lillooet Valley, from which it is shut off by Wolverine Pass. The lake is a small gem only about a mile in length, fed by the snow from Finch Ridge on the north and Ronayne Ridge on the south. A winter snowfall of some forty feet provides a considerable run-off, and leaves plenty of moisture for the vegetation. The lake is drained by a small river which goes tumbling down Tenquille Valley in an east-south-east direction, and finds its way into the Birkenhead. The lower part of the valley is heavily timbered, but above 5,000 feet the country is open, and rolls up to varying heights on the different hills. The landscape is dominated by Sun God mountain, a perfect peak of about 8,500 feet.

Sun God Mountain dominates the landscape of the Tenquille country; and after a week's stay in these hills, it is easy to understand why it was held in veneration by the Indians who named it. Although other points seem to gain and lose prominence as the sun moves round the heavens, Sun God is positioned so that it always shows to advantage. In the early morning, from the camp at Tenquille Lake, when other hillsides appear as dull masses, Sun God seems to pick up the sunlight; and when the evening shadows gather the last beam is reserved for Sun God. The explanation is three-fold: first, the mountain stands on the edge of the dry belt country and clouds rarely obscure it; second, the topography of the country is such that open valleys stretch toward the sunrise and the sunset; third, the mountain is sufficiently mineralized to give it plenty of colour, which is accentuated by glassy quartz and gulches full

A prospector's camp in Tenquille Valley.

Copper Mound at the western end of Ronayne Ridge from which it is separated by Fossil Pass in the foreground. The west side has a steep face overlooking Lillooet Valley, 6,000 feet below. The blue limestone extends from the pass nearly to the summit, which is capped with conglomerate. The thickness of the limestone is 600 feet or more.

Lupins and Indian paint brush on the Crown Mine trail.

Sun God Mountain at sunset.

Sunrise on Tenquille Lake.

of snow. The snow gulches on the face of the mountain, suggesting an open hand, are a feature. Grizzly Pass is on the trail from Tenquille Valley to the Bridge River country. Its name has been well-earned as a result of the numerous meetings between man and the big bears in the vicinity.

The first recorded ascent of Sun God was made from the Vancouver Natural History Society's camp at Tenquille Lake in August, 1931, by John Ronayne, Jr., the son of our guide, and P. L. Tait, a veteran of the British Columbia Mountaineering Club. They left camp at 4.30 a.m., reached the peak at 6 p.m., and were back at midnight.

The chief geological interest in the district is the limestone formation of Ronayne Ridge and Copper Mound. As the limestone weathers, the fossil remains appear, and these have been identified by Professor M.Y. Williams of the University of British Columbia as Upper Triassic. Their lesson briefly is that this belt, which is now between 6,000 and 7,000 feet above sea level, was formed in the sea and included a number of coral reefs in that far-off time before the granitic rocks of the Coast Range were formed. Cidaris plates and spines, represent the remains of the sea-urchins of those times.

CANADA'S ALUMINUM INDUSTRY

by **E. V. N. KENNEDY**

OUT of the laboratories of modern science come so many developments of immeasurable use and enjoyment to mankind that we, more often than not, take them for granted. For example, although iron, lead, copper and other metals have been known for thousands of years, it is only about a century since aluminum* was isolated as an element, and barely 53 years since Charles Martin Hall in the United States and Paul Heroult, working independently in France, almost simultaneously discovered the process now used for making aluminum.

Each inventor had his difficulties in developing the discovery beyond the laboratory stage, and it was only after nearly three years of patient and persistent effort that the new process was placed in commercial operation, the first production in the United States having occurred in November, 1888, and that in Europe apparently a little later. At that time chemically produced aluminum was selling for six or eight dollars a pound. The first aluminum by the new process sold for five dollars a pound, but the price was soon reduced to two dollars, and, in a few years, with lowered costs of production, to 65 cents a pound. (Today, the price is about twenty cents a pound.)

Strange to relate, the metal, in spite of the decreased price, failed to find a ready market. Research and intensive developmental and promotional work yielded discouraging results for many long years. In fact, it was nearly 1910 before a change occurred—but what a change it proved to be! Never in the history of metals has a metamorphosis been so complete. The production of aluminum then began its astonishing rate of increase, which has—with the exception of the depression years—carried through until today and, even yet, shows no signs of abating. In but the last quarter of a century, aluminum has risen from commercial obscurity until now, in annual volume produced, it ranks third in the whole non-ferrous metal group. Truly, it must be admitted that the demand which has been responsible for this increase in production is a most remarkable tribute to aluminum.

It should be noted that physical and chemical attributes alone do not determine where and how a metal may be used. There is the matter of economics. Purchase cost is one thing; design cost is another and so is each of fabrication, installation and maintenance, as well as salvage value at the end of the useful life of the article, no matter what it be. A metal should be chosen for a given rôle which will do its job at the lowest overall cost.

Aluminum Light and Strong

Aluminum is a silvery-white metallic element weighing only about one-third as much as nickel, copper, zinc or steel, and less than one-quarter as much as lead. Soft and very malleable in its pure state, it can be made hard and, when properly alloyed with small quantities of copper, silicon, manganese, magnesium, nickel and a few other elements, as strong as structural steel. Because of its natural oxide coating, aluminum resists tarnishing unusually well, but, if treated to produce a special oxide coating, will not tarnish even under extreme conditions. This coating is very

*"Aluminum" and "aluminium" mean exactly the same thing. Each is correct although, in point of fact, the former is older and, because it is widely used in Canada, will be found throughout this article in all references to the metal. These words can be traced back to ancient Rome at the time of Pliny from the Latin *lumen* meaning "light" because of the brightening effect in dyeing operations of certain salts later identified as containing aluminum. Before aluminum was isolated, its oxide base came to be known as "alumina". Sir Humphry Davy, in 1807, attempted to produce aluminum from this substance but was unsuccessful. He said if he had obtained the metal he would have called it "alumium", but later altered the name to "aluminum" to correspond with that of its base, "alumina". Still later, "aluminium" came into more or less general use, the change to this word being made because the names of many metallic elements end with "ium"; today, this is the word generally used abroad. Somehow or other, when the metal became available in North America, popular usage quickly reverted to the second name suggested by Sir Humphry Davy and thus do we find both "aluminum" and "aluminium" used to identify the one substance.

LEFT:—Tapping an aluminum furnace.

useful, for not only will it preserve a brilliant polish, making aluminum a very useful reflector material, but it also may be dyed. As the colour is then an inherent part of the surface of the metal, it will not crack or peel. Aluminum is non-toxic and is therefore one of the few metals which may be safely used in contact with foods, either in their preparation or packaging. Ordinarily stable, at very high temperatures or in the presence of strong alkalies the metal becomes a strong reducing agent. As such, it is used for removing dissolved gases from molten steel or for isolating certain metals from their ores. Aluminum is one of the best conductors of electricity and, paradoxically enough, is also one of the best conductors as well as insulators of heat, depending upon how it is employed.

The use of this light metal in aircraft has drawn public attention to the high strength-weight ratio of aluminum. However, there are many other applications of the metal which do not directly depend upon this quality. It is true that pound for pound aluminum is more expensive than many other commonly used metals, but it is also true that, because of its lighter density, aluminum will go about three times as far. In other words, about three times as many articles can be made from a given weight of aluminum as from the same weight of other metals.

Then there is the fact that, even though aluminum is not attacked in the commercial sense of the word by such chemicals as concentrated nitric and acetic acids, which makes the metal very useful in connection with the preparation, storage and shipping of such substances, any superficial attack that may occur can only produce colourless compounds. Thus does aluminum find extensive use in the rayon, textile and paint industries. Also, since the metal is non-toxic, various fermentative operations are performed in aluminum equipment because that metal does not poison the yeasts and other organisms on which the reactions depend.

Aluminum is employed so much today that its uses are practically countless. To exemplify but a few of them, however, it may not be out of place to "follow the clock around" . . . Your breakfast is prepared in aluminum utensils. The fruit you eat comes great distances in refrigerator cars insulated with aluminum foil. Your cream bottle has an aluminum seal. Your trip to the office is made in a street car or bus having an aluminum body or, if you drive, your car has aluminum pistons and, perhaps, an aluminum cylinder head and an aluminum crank-case. Your cigarettes or tobacco and candy bars are wrapped in light-proof, gas-proof, moisture-proof aluminum foil. Meanwhile, at home, cleaning is done with an aluminum vacuum sweeper, and clothes are laundered in a washing machine having the gyrator and other parts made of aluminum. As with breakfast, your lunch and dinner are prepared in aluminum utensils. The tea you drink is packaged in aluminum foil. The gas for cooking comes from reservoirs covered with aluminum paint, and gasoline for your car is bulk-stored in tanks similarly protected. The electric light and power you use comes from the generating stations over aluminum transmission lines, and your radio and refrigerator contain aluminum.

Although the above recitation may seem hypothetical, it is true to a surprising degree, and the examples cited by no means exhaust the list of direct and indirect everyday uses of aluminum. The indirect uses are particularly multitudinous because aluminum finds employment in so many ways industrially, from huge tanks in the chemical industry to wire for geo-physical apparatus, so fine that it is invisible to the naked eye and, incidentally, worth nearly half a billion dollars a pound!

Two Smelters in Canada

Relatively unheralded and unsung, Canada has held and continues to hold a pre-eminent place in the world's aluminum industry. Today there are two large aluminum smelters in this country. One smelter is at Shawinigan Falls, Quebec, and the other at Arvida, Quebec, the latter being one of the largest in the world. Both are owned by the Aluminum Company of Canada, Limited.* Each year nearly half a million tons of basic raw materials,

*Contrary to popular belief, the Aluminum Company of Canada, Limited, is not a subsidiary of the Aluminum Company of America. It is true that at one time it was, but today the Canadian company has no corporate connection or affiliation whatever with any United States company. It is now a subsidiary of Aluminium Limited (which is incorporated under the Companies' Act of the Dominion of Canada) and has been since June 4, 1928, at which time the Aluminum Company of Canada, Limited, and practically all the other holdings of the Aluminum Company of America outside the United States were acquired by Aluminium Limited. Aluminium Limited obtained these properties in exchange for its common capital stock which it issued to the Aluminum Company of America. That company immediately distributed all the Aluminium Limited common capital stock it received to its shareholders, who were given one share of common capital stock of Aluminium Limited for each three shares they held of the common stock of the Aluminum Company of America. At that instant, the shareholders of Aluminium Limited and Aluminum Company of America were identical, but since then, due to the ordinary buying and selling of the shares of both companies in the open market, the share ownership has undoubtedly changed. The two companies do not have any directors or officers in common.

unobtainable in Canada, are brought into this country to be used in the production of aluminum. These materials come from such diverse points as within a few degrees of the Arctic Circle to within a few degrees of the Equator.

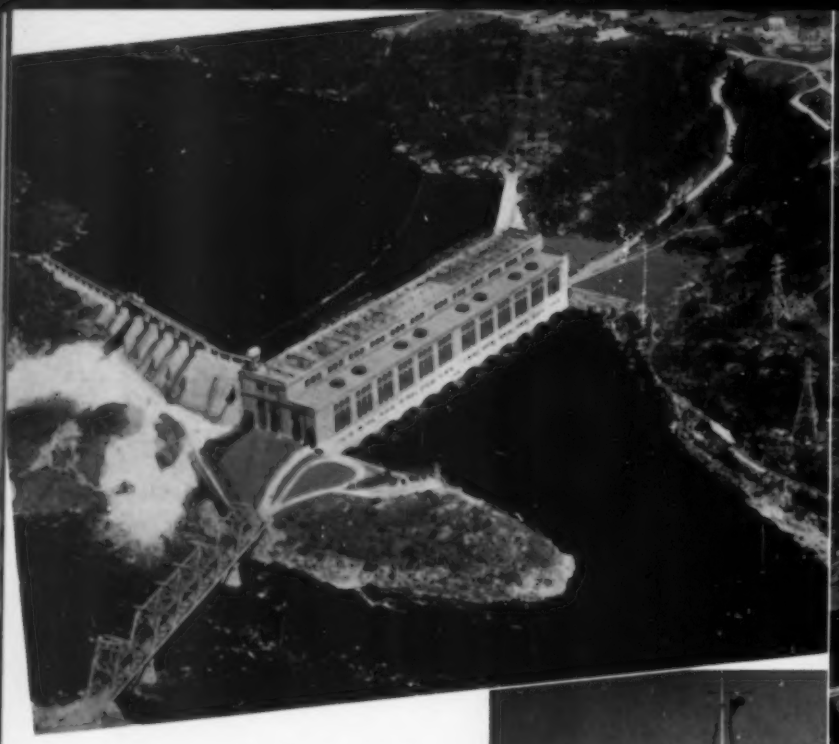
The beginning of the aluminum industry in Canada goes back more than a third of a century to 1899. On August 14 of that year construction started of the Shawinigan Falls smelter. Two years later —on October 20, 1901, to be exact—the first aluminum ingots were cast. A fact of which few persons are aware is that this plant, although preceded by one or two others now dismantled, is the longest established aluminum smelter operating today in North America. Incidentally, the Aluminum Company of Canada was the first to generate electric power on a large scale at Shawinigan Falls—then but a small hamlet, and now a highly industrialized city.

As may be surmised, this company, which first received its charter as the Northern Aluminum Company, Ltd., (the name having been changed to the present one in 1925), is inextricably connected with the development of the aluminum industry in Canada. The policy which that organization has followed ever since the building of its first smelter at Shawinigan Falls has been one of pioneering and expansion. In other words, from time to time, plants connected in one way or another with various phases of the aluminum industry have been built in Canada and usually with capacities considerably greater than domestic consumption. Furthermore, the plants have been expanded until today the Aluminum Company of Canada has correlated and integrated units which, together with its interests in British Guiana, enable it to produce well over 150 million pounds of aluminum each year from bauxite to ingot. A very valuable feature of such correlation and integration is the control they give throughout all operations to ensure that the finished aluminum, whatever be its form, is of the highest possible quality. An additional fact of no little importance is that the Canadian aluminum industry has sufficient reserves of ore in sight today to enable it to operate at full capacity for many years.

But we are ahead of the story. As previously pointed out, world demand for aluminum began to increase rapidly about 1910. To cope with the ever rising demand, the Shawinigan Falls smelter was enlarged from time to time, but before many years went by it became evident that greater capacity was desirable than was ultimately permitted there. The result was that, in 1926, the establishment at Arvida was created.

Not only did this involve building an aluminum smelting plant, but also the erection of a cryolite plant (for purifying cryolite), a carbon plant (for making carbon blocks used in smelting), an ore plant (for concentrating bauxite) and a fluoride plant (for making acid). Before the last four plants were completed, the Canadian aluminum industry was dependent upon imports for its treated cryolite, carbon blocks, bauxite concentrates and fluoride, but now it became independent. The creation of Arvida involved more construction than this, however, for a model town, complete with homes, schools, churches, recreational facilities and a well-equipped hospital appeared almost overnight on a high plateau on the south bank of the Saguenay River. To handle incoming raw materials and outgoing finished products, terminal facilities were acquired at Port Alfred, twenty miles distant, on Ha! Ha! Bay—the head of deep-sea navigation on the Saguenay River. It was also necessary to buy a railroad, and rehabilitate it, to connect Arvida with the port. Last but not least, it was essential to develop power in huge quantities.

Steamer loading bauxite at Mackenzie, on the Demerara River, British Guiana, for direct shipment to Port Alfred, Quebec.



Hydro-electric station at Isle Maligne, having an installed capacity of 540,000 h.p. This is owned by the Saguenay Power Company, Ltd., a subsidiary of the Aluminum Company of Canada, Ltd.

Discharging bauxite from British Guiana at Port Alfred, Quebec, whence it is transported twenty miles to the aluminum plant at Arvida.

Drilling holes in the rock-like deposits of bauxite preparatory to blasting.

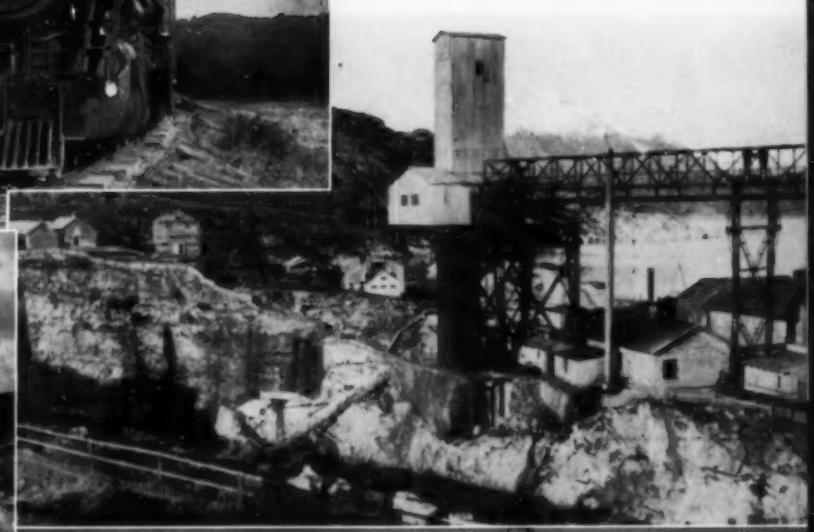
TOP:—Arvida plant of the Aluminum Company of Canada, one of the largest in the world. The average electric power load is nearly one and a half times that of Greater Montreal

LEFT:—Petroleum coke, required by the aluminum industry, being loaded at a Gulf of Mexico port, for shipment to the plant at Arvida.

Arvida, a self-contained community in northern Quebec, adjacent to the aluminum plant.

The Roberval and Saguenay Railway, a subsidiary of the Aluminum Company of Canada, Ltd., connects Arvida with Port Alfred, Quebec.

Cryolite mine at Ivigtut, Greenland, the sole commercial source of this mineral.



BOTTOM:—Bauxite, loosened by blasting, is transported ten miles to Mackenzie, on the Demerara River, British Guiana. After being crushed, washed and dried, it is shipped to Port Alfred, Quebec.

RIGHT:—Removing the overburden of soil and sand, sometimes 100 feet deep, to expose bauxite beds.

Bauxite Main Raw Material

Although aluminum is the most abundant metallic element in the earth's crust, and is present directly or indirectly through absorption from the soil in all grains, vegetables and fruits, and in milk, eggs, meats and drinking water, there is only one ore of the metal, and that is bauxite. Aluminum could be produced from any of its natural occurrences, such as any claybank or even the ruby, but the cost of the aluminum so obtained would be so much higher than the metal made from bauxite, which yields the lowest cost aluminum, that no one would buy it. Even from bauxite, the production of the metal is a long, tedious and painstaking operation requiring a huge investment not only in plant and equipment but also in technique and in work in process. To build and equip the necessary plants alone is said to require an investment of over one dollar for each pound per year of smelting capacity.

Bauxite, which varies from creamy white to reddish brown in colour, consists essentially of aluminum hydrate, or aluminum in chemical combination with oxygen and water, and about eight per cent of other materials. These other materials, comprising such things as silica, iron oxide and titanium oxide, are impurities as far as making aluminum is concerned. The elimination of these impurities is a costly process.

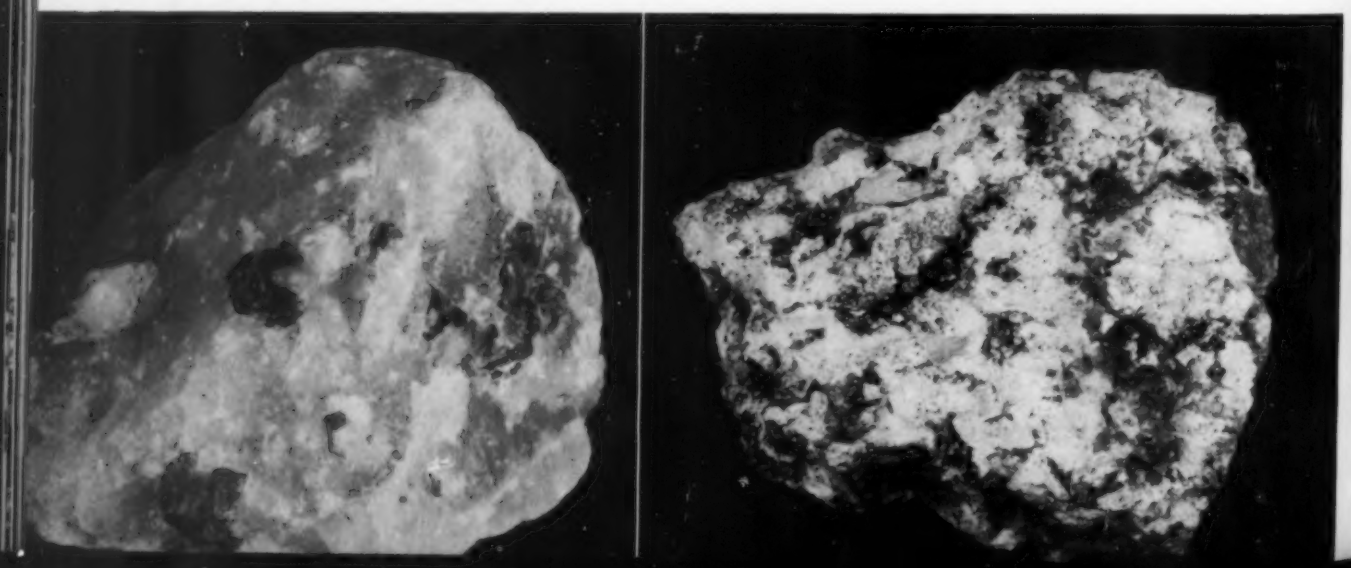
Extensive deposits of bauxite are found practically throughout Europe, which is very fortunate for the rapidly expanding aluminum industry there. Large deposits also occur in the Dutch East Indies, which are being used for the new Japanese aluminum industry, as well as in Africa, Australia, the United States, Dutch Guiana, Brazil and India. Unfortunately, Canada has no bauxite, and it is the universal opinion of geologists that none is likely to be discovered.

All supplies of this material for the Canadian aluminum industry come from British Guiana, where the Demerara Bauxite Company, Ltd., a subsidiary of the Aluminum Company of Canada, mines the ore. The bauxite is not found on the ground, where it would be easy to obtain, but instead lies as much as 100 feet below the surface. The overlying material, or overburden as it is called, consists of clay and sand and, together with the jungle growth, must be removed before the ore can be mined. Literally speaking, hills have to be moved to get at the ore.

The deposits, which vary in thickness from a few feet to 25 feet or more, are very hard and are broken by blasting. The pieces are loaded by power shovels into railway cars for transportation to the beneficiation plant at Mackenzie, ten miles away, where it is crushed, washed, dried and shipped direct by ocean-going vessels to Port Alfred, Quebec, 3,223 miles distant. Mackenzie, a model tropical community, is 65 miles up the Demerara River from Georgetown, the capital of British Guiana. At Port Alfred, the bauxite is trans-shipped to cars of The Roberval and Saguenay Railway Company, another subsidiary of the Aluminum Company of Canada, and transported the remaining twenty miles to Arvida.

LEFT:—Cryolite, used as a flux in smelting aluminum, is brought from Greenland.

RIGHT:—Bauxite, four tons of which are required to produce one ton of aluminum, comes from British Guiana.



The bauxite town of Mackenzie, which came into being about twenty years ago, extends for about a mile along the east bank of the Demerara River. It has all modern conveniences such as electric light, running water, a sewage system, paved streets and telephones, the last being for local use only and for communication with the mines eight to ten miles away. A well-equipped, efficiently-staffed hospital, operated by the company, ensures the residents of proper medical facilities and care. A clearing about one-quarter of a mile in width extends around the community as a sanitary safeguard against mosquitoes. Dwellings are designed for tropical conditions. For example, as a protection from termites, the houses are supported about eight feet above the ground on concrete posts, each of which has a small pool of oil around its base. All the staff houses are entirely screened, which, strange to say, was an innovation in British Guiana.

Travel between Mackenzie and Georgetown is ordinarily by river steamer and occasionally by seaplane, which is available at Georgetown for charter. There are no railroads at Mackenzie, except to the mines, nor highways, except for the mile-long street which runs the length of the town. Here at least is one place where there is little or no traffic problem, for there are only two automobiles and two or three trucks. A government wireless station and, of course, a post office maintain communication with the outside world.

Other Raw Materials

Although bauxite is the largest single raw material required for the production of aluminum, four tons being needed to make one ton of the metal, approximately three tons of other materials are also required. The most important of these are petroleum coke, metallurgical coke, cryolite, fluorspar, soda ash and fuel oil. Pitch, tar and a number of other miscellaneous supplies are also consumed.

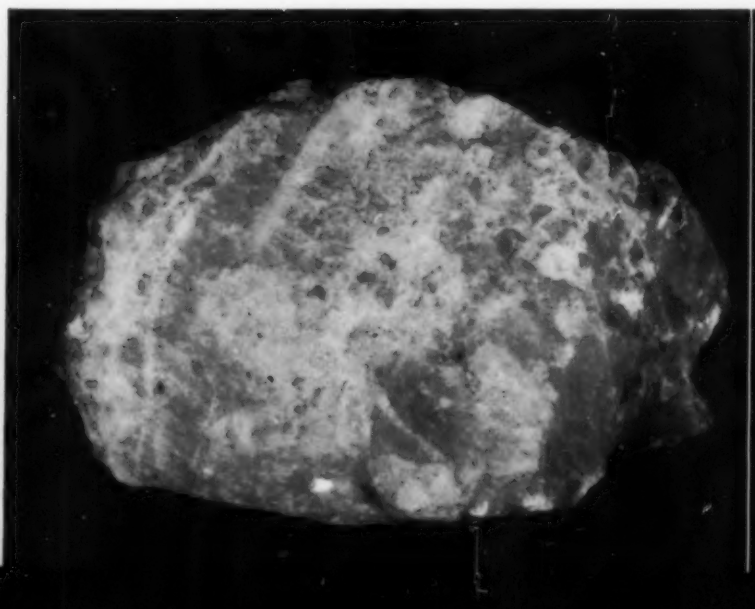
A large part of the aluminum production consists of aluminum alloys. For this, various alloying materials are required, such as silicon and ferro-silicon, manganese and ferro-manganese, copper, nickel, magnesium, titanium, zinc and chromium. It is seldom that more than a few per cent of any of these materials is added to aluminum. However, because of the tremendous aluminum production, the total consumption of the alloying metals by the Canadian aluminum industry is quite appreciable.

The necessary supplies of petroleum coke are not obtainable in Canada, so they are largely imported and come mainly from Gulf of Mexico and Great Lakes ports. Petroleum coke, a by-product of the oil refining industry, is used for aluminum smelting because it is practically pure carbon. Metallurgical coke, which is very similar to coke for heating houses, is used in two varieties. One kind is for supplying heat in remelting furnaces and is obtained from Canadian suppliers; the other is for lining the electric furnaces and, like petroleum coke, must be imported.

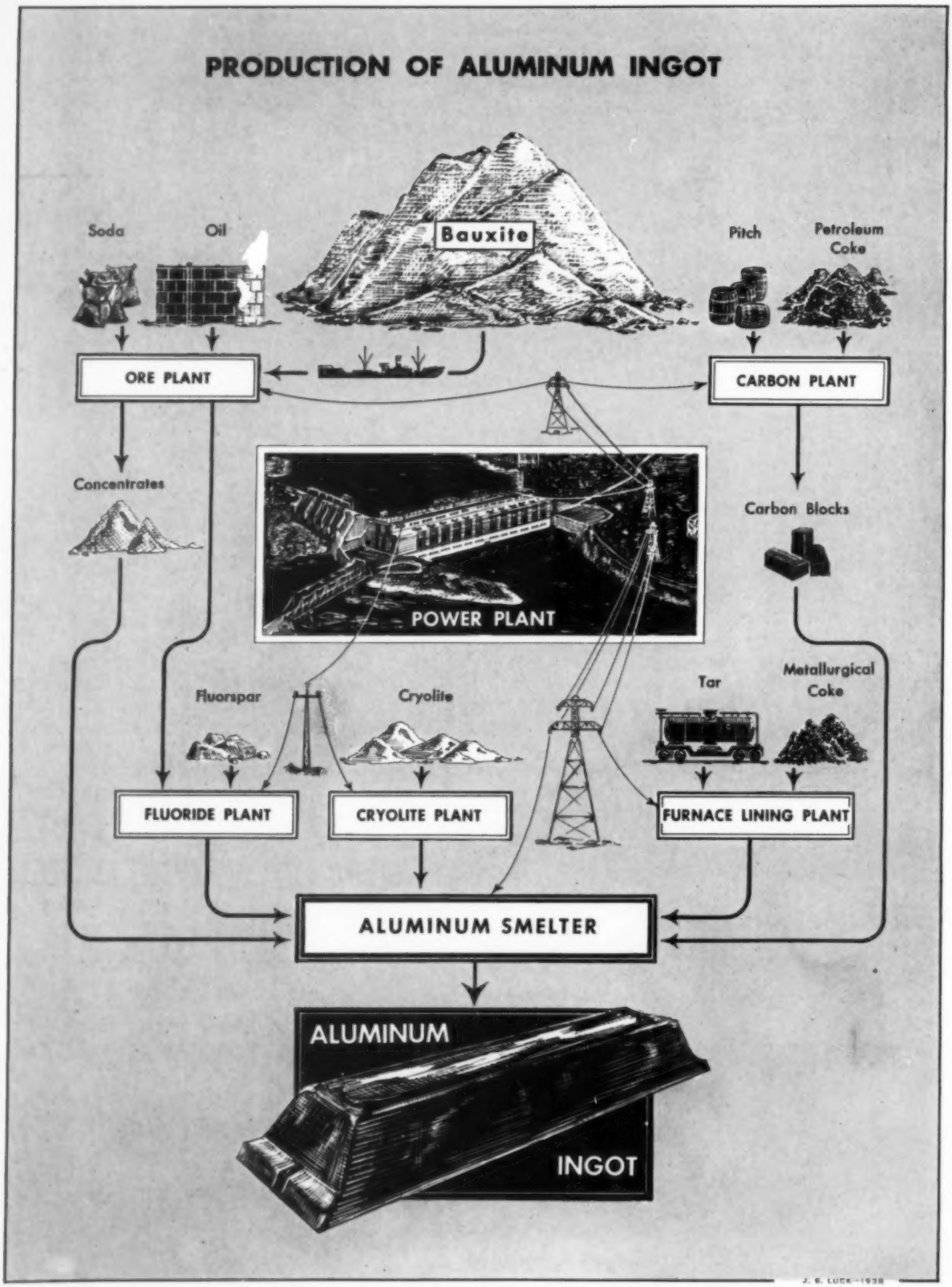
Cryolite, a word of Greek origin meaning *ice-stone*, is found in commercial quantities only in Greenland, where the deposits are controlled by the government of Denmark.

LEFT:—Fluorspar is imported mainly from Southern Europe, Canadian supplies being inadequate.

RIGHT:—Petroleum coke, nearly one ton of which is consumed in smelting one ton of aluminum, is a by-product of the oil refining industry.



PRODUCTION OF ALUMINUM INGOT



IT TAKES ABOUT SEVEN TONS OF RAW MATERIALS, PLUS ELECTRICAL ENERGY EQUIVALENT TO SIXTEEN TONS OF COAL, TO PRODUCE ONE TON OF ALUMINUM.

The mines are at Ivigtut, near the Arctic Circle, whence the raw mineral is shipped to Arvida via Port Alfred. The main world uses of cryolite in ascending order of importance are for insecticides, ceramics and the smelting of aluminum. The principal source of cryolite is the natural material, but synthetic cryolite is being used in greater quantities each year.

Domestic mines have not yielded sufficient fluorspar, so it has been necessary to import the requirements, which come mainly from Southern Europe. Although soda ash, fuel oil, pitch and tar are all obtained from Canadian suppliers, many of these materials in turn are, at least in part, made from imported basic raw materials.

Power an Essential Item

As has just been related, Canada has no ore of aluminum and lacks all or practically all of the other basic raw materials required in the smelting of the metal. However, Canada does have one essential commodity, and that is power. Of all electro-metallurgical operations, the production of aluminum consumes the most electricity, and it is precisely because this country has such huge quantities of low cost hydro-electric power that the aluminum industry has been established here. Conversely, it may be said that, because of its tremendous power requirements, the aluminum industry has played a large and important part in the development of Canada's power resources. Canada's total installed hydro-electric capacity at the end of 1937 stood at 8.1 million horsepower and, of this, plants with capacities aggregating one million horsepower were engaged in supplying power for smelting aluminum.

The average amount of electric power needed to supply the single establishment of the Aluminum Company of Canada at Arvida is nearly one and one-half times as much as the average load of the whole of Greater Montreal. When it is remembered that this is Canada's largest metropolitan area, and contains not only many homes but a very large number of industries as well, the importance of power to aluminum can be appreciated more readily. Another way to look at this fact is to realize that the electrical energy consumed in making one ton of aluminum would supply the average home in Canada with electric light, heat and power for 25 years, or would make no less than 18 tons of newsprint. Obviously, if aluminum is to sell at a low enough price to enable it to be widely used, the cost of power entering into its production must be low.

It may not be out of place to remark at this point that the total consumption of power by the Aluminum Company of Canada places that company as Canada's largest consumer of electricity.

Smelting by Electricity

The electric furnaces used in smelting aluminum are topless, rectangular shells made of steel plates and measure about 10 feet by 16 feet. The shells are thickly lined with a paste made of ground metallurgical coke and tar, then baked to obtain the necessary hardness. Separately, another paste is made by grinding the petroleum coke and mixing it with pitch. Two things can happen to this paste. One thing is that it be pressed into blocks measuring about 15 inches in each dimension and then baked to obtain hardness. The baking operation requires one month. These cubical carbon blocks are used in one type of electric furnace. Another, the Soderberg type of electric furnace, now being tried out at Arvida and Shawinigan Falls, uses the petroleum coke paste in a slightly different way. In this case the paste is added as required to the top end of a large metal tube, or casing, of rectangular cross-section, which extends downward into each furnace, and the baking is accomplished mainly by incident heat from the smelting process as the paste slowly descends. A large, hard carbon block continuously emerges from the lower end of the tube at the same rate it is being burned. Nearly one ton of either type of carbon blocks is consumed by combustion in making one ton of aluminum

Cryolite enters into the smelting of aluminum by acting as a flux. It is first treated to remove such natural impurities as metallic sulphides and carbonates. To start a furnace, a large quantity of pulverized and purified cryolite is placed in the carbon-lined steel shell and heated to the molten stage by the passage of a heavy electric current. The carbon blocks are then extended into the bath (the temperature is about 1000°C.), and the furnace is ready to receive the aluminum "ore". The electric current, in some cases amounting to 40,000 amperes, or nearly 200,000 times as much as flows through an ordinary 25-watt house lamp, enters the furnace through the carbon blocks,

Power house at Chute-à-Caron, where the Aluminum Power Company, Ltd., has created a 260,000 h.p. hydro-electric station for the supply of power to the aluminum plant at Arvida.

Photo by A. C. Johnston

passes through the cryolite and leaves by the carbon lining.

Bauxite is not introduced to the furnace in its raw state, but first must be concentrated. To do this it is treated with a hot solution of caustic soda under pressure. The aluminum hydrate in the bauxite goes into solution, but the impurities are not dissolved. The latter are separated by filtering and then discarded. By suitable treatment, the aluminum hydrate is now precipitated, separated, and then heated to drive off the chemically combined water. The resulting product is bauxite concentrates, a fine, white, powder-like substance which essentially consists of aluminum chemically combined with oxygen.

Actually, the production of the concentrates is considerably more involved than the foregoing brief description would indicate. The hydrate in the bauxite does more than merely dissolve in the caustic soda solution—it forms a new material called sodium aluminate. And, after the undissolved impurities have been removed, the whole chemical action must be made to completely reverse itself to produce nothing less than the basic substances originally started with. To perform this complicated feat and, at the same time, make it of commercial value is a triumph of the modern chemical engineer.

The concentrates are charged periodically into the electric furnaces and dissolve in the molten cryolite. The aluminum and oxygen are separated by the action which takes place within the furnaces. The oxygen rises and burns the carbon blocks, and the aluminum, being heavier than the molten cryolite, sinks to the bottom of the furnaces, whence it is "tapped" every day or two and cast into ingots. Because of the hundreds of electric furnaces used, the intermittent tapping of each furnace is smoothed into a continuous production at each smelter.

The aluminum establishment at Arvida is self-contained. The one at Shawinigan Falls is not, but receives its carbon blocks, Soderberg paste, treated cryolite, fluoride and bauxite concentrates from Arvida.

Fabrication of Aluminum

In addition to mining ore, concentrating it and making aluminum ingots from the concentrates, as well as all the other ancillary operations, the aluminum industry embraces still another phase, namely, the fabrication of the ingots into useful

Aluminum smelter and wire mill at Shawinigan Falls, Quebec, where the first ingots were cast on October 20, 1901. Here the industry in Canada had its inception.

Canadian Airways Limited.

forms. Fabrication of aluminum can be broadly classified from two different, but more or less overlapping, standpoints. One standpoint is the method of fabrication as:

a—Wrought:	Rolled
	Extruded
	Drawn
	Spun
	Forged
	Pressed
	Powdered
b—Cast:	Sand
	Permanent Mould
	Die

The other standpoint is the essential means by which the ultimate mechanical properties are obtainable during fabrication, as:

a—Work-Hardenable Aluminum

b—Heat-Treatable Aluminum

Work-hardenable aluminum embraces "electrical conductor metal" and "common", "non-heat-treatable", or "soft", alloys as they are variously termed. Heat-treatable aluminum embraces the "strong", or "hard", alloys.

Most of the seven methods of fabricating wrought aluminum can be subdivided into a number of other categories. For example, there is the rolling of flat and coiled commodities, such as plates, sheets, strips and foils, as well as the rolling of bars, rods and structural and other members having various cross-sectional shapes. Again, extrusion may be by slow pressure or impact. The former is somewhat akin to a cake decorator, or icing syringe, in which the icing paste is squeezed through one of a number of nozzles of various designs: in the case of aluminum, a hot (but not molten) cylindrical aluminum billet is placed in a cylinder, and a piston, with several thousand tons pressure behind it, forces the aluminum through a die. Aluminum can be fabricated in this way into shapes varying from simple rods and tubes to those having very intricate cross-sections. Impact extrusion is employed in making "collapsible" tubes, of which tooth-paste containers are perhaps the most familiar example. An aluminum slug, or thick disc, is placed in the bottom of a cylinder, and a piston, having a clearance equal to the wall thickness desired in the collapsible tube, descends with great force and rapidity. When the piston hits the slug, the aluminum is squirted up and around the piston. At the same time the aluminum is forced into recesses in the bottom of the cylinder, which forms the

Pouring aluminum sand castings, so called because the moulding material consists of sand.

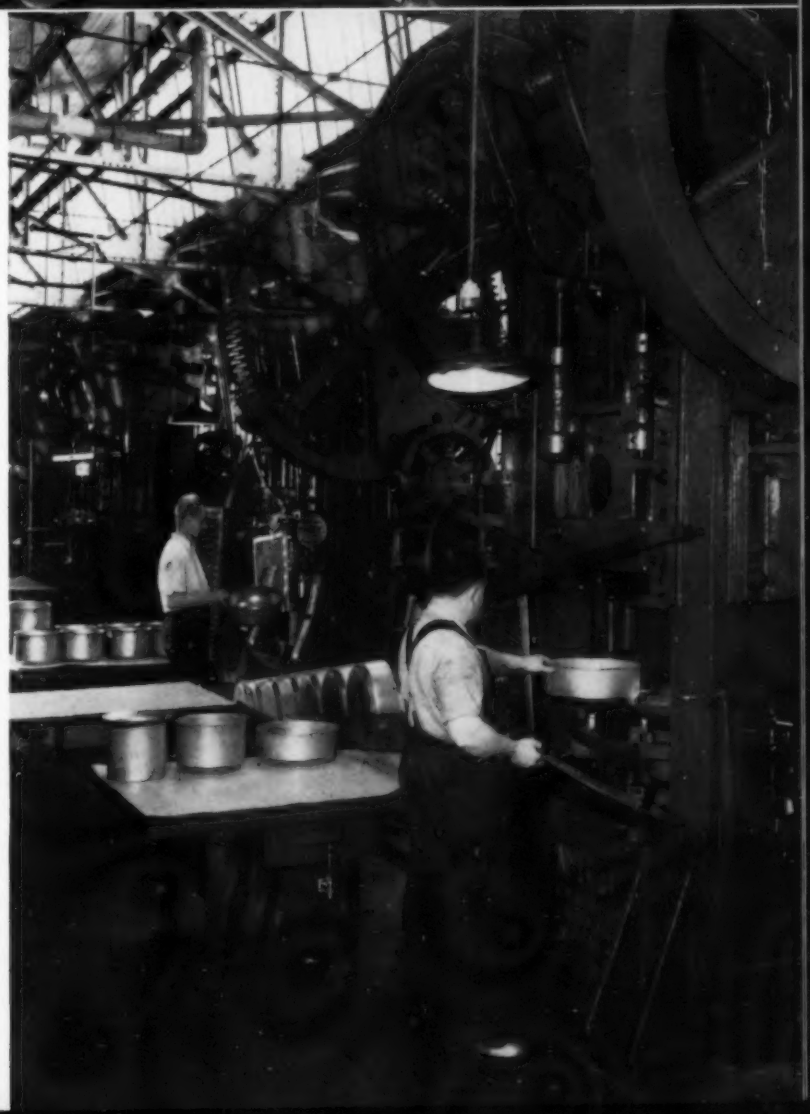
cap-post, thread and the conical crown of the tube.

Drawing comprises pulling the metal through dies, each die being successively smaller than the previous. Of course, before being drawn through the first die, the aluminum must be of the proper shape to go into it. It is so prepared by rolling or extrusion. Aluminum wires and tubes are some of the products made by drawing. There is another type of drawing which is used in making aluminum cooking utensils and other hollow-ware. A piece of sheet aluminum is placed at the open end of a die, or cylinder. The other part of the die is a piston which will clear the cylinder by the thickness of the aluminum sheet. The piston forces the aluminum into the cylinder, drawing or forcing the sheet into the basic shape of the ultimate utensil.

Spinning usually starts with a drawn shell of aluminum in which is placed a chuck, or mandrel, having the shape of the finished article and revolved at high speed. Tools held against the spinning shell make it conform to the shape of the chuck. In the case of some hollow-ware, like the spun body of a teakettle, it is necessary to have a chuck which can be dismantled afterwards so that it may be removed. Forging may be done with nothing more than an ordinary hammer and an anvil or some other hard surface. However, for making such articles as aeroplane propellors and connecting rods, massive equipment is needed in which the hammer and anvil are dies which, with successive blows, knead the metal into the finished shape. Pressing is somewhat akin to extrusion and forging in that hot (but not molten) metal is steadily forced by tremendous pressure into a die. Pulverizing is the process whereby aluminum is made into the almost microscopically small flakes used principally as the pigment for making aluminum paints and inks. Tiny spheres of aluminum, formed by atomizing the molten metal, or clippings from thin aluminum sheets are placed in a ball or stamp mill. The continual pounding eventually reduces the original aluminum into the well-known powder or paste (the latter results if the pounding is done in the presence of mineral spirits).

Aluminum castings are made with molten metal which may be poured manually, either into sand or "permanent" metallic moulds, or may be of the type known as die castings, in which case the molten aluminum is machine-fed under pressure into metallic moulds.

ABOVE:—Rolling aluminum foil, which is used for a wide variety of purposes.



RIGHT:—Heavy presses are used in drawing aluminum "circles" in the manufacture of cooking utensils. Provision is made here, as in all other operations, to safeguard the workers from injury

Aluminum is finding an increasing use in the construction of modern railway coaches.
—C.N.R.

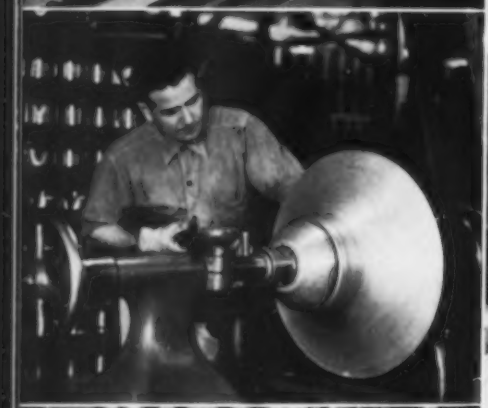
An "all aluminum" aeroplane of the Trans-Canada Air Lines.

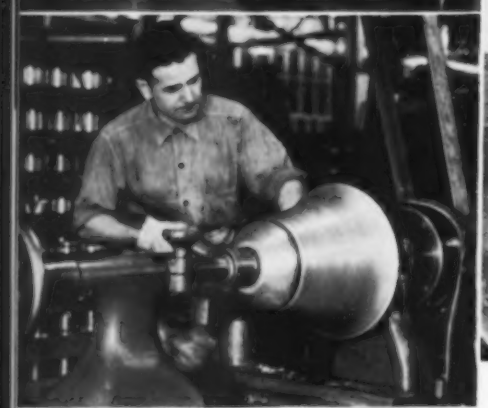
Street cars with aluminum bodies have been in service for a number of years.

Interior decorators are utilizing forged and other forms of aluminum to an increasing degree.

Aluminum painted bridge spanning the Saguenay River at Chicoutimi, Quebec.

Trackless trolley-bus and autobus, in the construction of which aluminum plays an important part.





A large proportion of the production of sheet aluminum is sheared into "circles". Every circle receives careful inspection.

The spinning process: stages in the production of an aluminum pail from a "circle."

It so happens that a given aluminum product frequently can be made by one or more fabricating methods. Seamless tubes, for example, may sometimes be extruded in their finished size or may first be extruded as a bloom and then drawn to size; the extrusion billet may either be cast with the initial hole through it or cast solid and the hole pierced. Some articles can be made by any of the casting methods, or may be forged, and certain structural shapes can be rolled or extruded. As to which method or combination of methods is employed for such cases depends sometimes on the purpose for which the aluminum product is to be used. For example, a given alloy may be rolled or extruded into a given structural shape and, although each will have the same appearance, the

physical properties will differ, making one or the other more suitable for some purposes.

It is important to realize that the common and strong alloys may be and are fabricated by the same general methods. However, although equipment which can fabricate strong alloys is also used for fabricating common alloys, equipment which was designed for the latter cannot, with few exceptions, be used for fabricating the former. Common alloys came first. It was on them that the aluminum industry was built, and plants for their fabrication are rather widely distributed in a number of countries. Strong alloys are a somewhat recent development and, although their commercial use is increasing fairly rapidly, they have a relatively much smaller application than common alloys because of their somewhat higher cost. Equipment for the fabrication of strong alloys is quite expensive, so only countries which have large domestic markets can support the necessary plants.

Aluminum Fabrication in Canada

The establishment of the aluminum fabricating industry in Canada dates back as far as that of aluminum smelting, inasmuch as a wire mill was built by the Aluminum Company of Canada at Shawinigan Falls in 1901.

Until 1915, all the aluminum wire and cable produced in Canada was fabricated from imported aluminum rod. However, since the construction in that year of a rolling mill at Shawinigan Falls for rolling rod from aluminum wire-bar, all the operations for the production of aluminum wire and cable from the ingot have been performed in Canada. In 1937, a machine for drawing aluminum tubes was added to the equipment at Shawinigan Falls.

The Toronto fabricating plant of the company also is an important producer of fabricated aluminum in various forms. Construction of this plant was started in 1912. The foundry for producing aluminum castings commenced operating in 1914, and in 1916 the sheet rolling mill began making aluminum sheet from aluminum rolling slabs. Until 1922, the sheet mill imported an appreciable proportion of the necessary slabs, but since then this plant, due to the installation of additional melting equipment, has been performing all the operations for the manufacture of aluminum sheet from the raw ingot. The screw-machine products division was put into operation in 1925. Three years later the foil mill started rolling aluminum foil and, in 1930, a mill for making seals and caps from aluminum sheet commenced production. Cooking utensils were made at the Toronto plant as early as 1913, but in 1931 this division was taken over by Aluminum Goods Limited, a subsidiary of the Aluminum Company of Canada, formed especially to manufacture and sell this type of product.

Thus has this organization established and expanded the aluminum industry in Canada. But, although the company is the only producer of aluminum ingot in the Dominion, it is by no means alone in the business of fabricating aluminum. There are about twenty other factories in Canada which use aluminum as their main raw material and work it into finished products, such as cooking utensils, wires, cables, shoe-lasts and various specialties. Furthermore, aluminum is fabricated far more widely than the foregoing would indicate, for there are a large number of plants spread across the country from coast to coast, such as bronze, brass and iron works, and car building, metal working, wire drawing and machine shops, as well as aircraft factories and firms manufacturing automobile parts and outboard motors, which have appreciable production of aluminum in many forms. Excluding this production, on which comprehensive statistics are not available, the aluminum industry in Canada employs about 5,000 workers and last year turned out products valued at least at 23 million dollars.

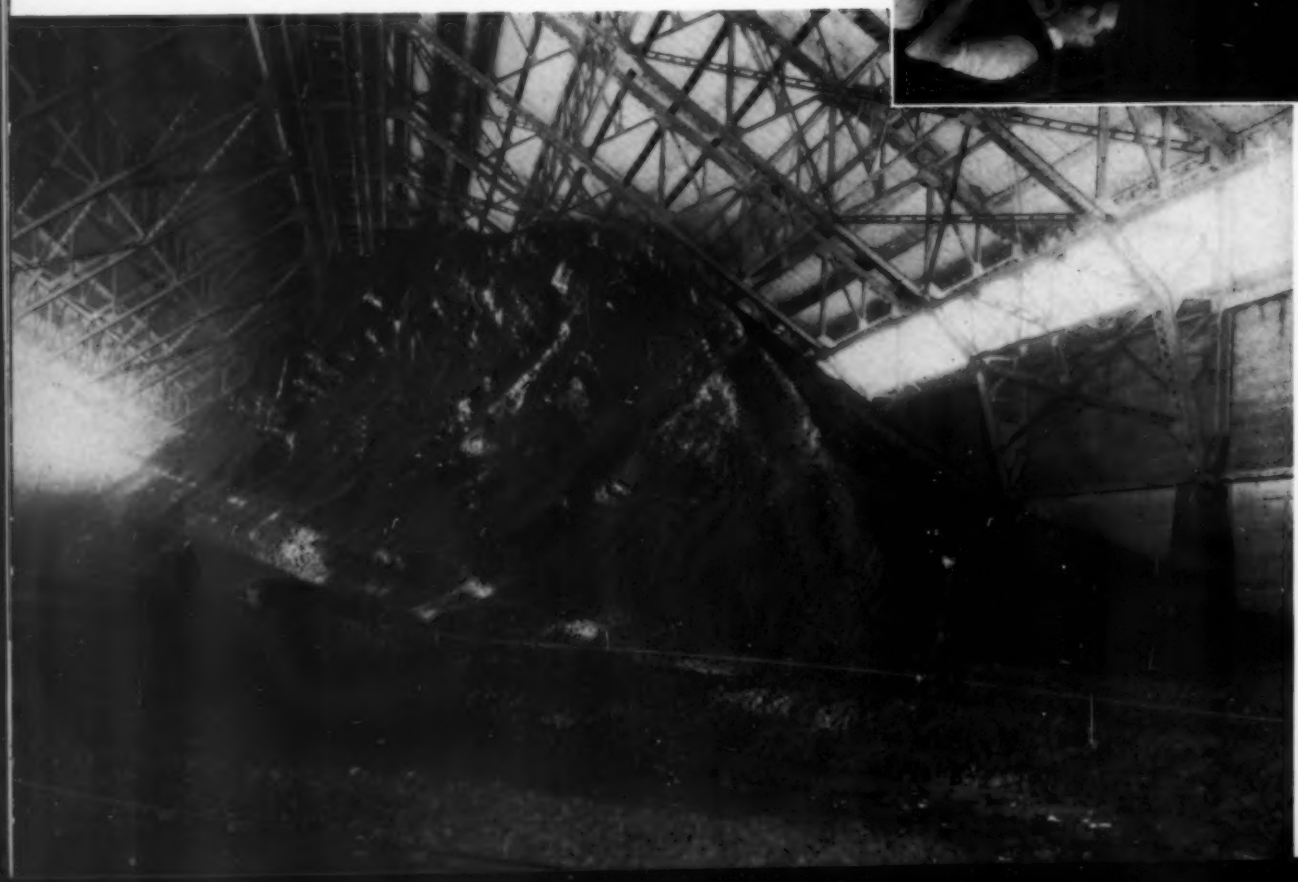
There is very little fabrication of strong-alloy aluminum in Canada primarily because of the small domestic market. The Aluminum Company of Canada is equipped to make and does make strong-alloy products, but comparatively few, and only in a limited number of the many varieties demanded in relatively small quantities from time to time. The domestic demand for such aluminum products as are not made in Canada is met by exporting Canadian ingots to some country, such as the United Kingdom, which has the necessary conversion facilities, and bringing the desired materials back to Canada. In this way are the Canadian consumers of small amounts of miscellaneous aluminum articles served at the lowest cost. (Aluminum ingots from Canada enter the United Kingdom free of duty, and most fabricated as well as all crude aluminum from the United Kingdom now enters Canada free of duty.)

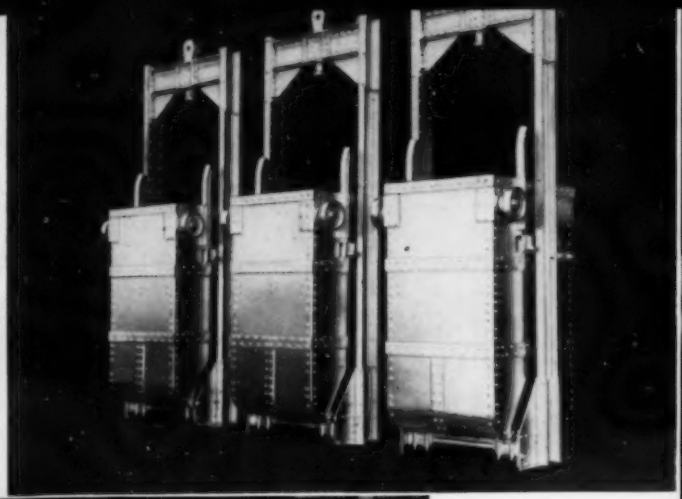
ABOVE:—Drums for maple syrup and other industries are made of aluminum.

BELOW:—Petroleum coke in storage at Arvida, where several hundred thousand tons of raw materials are accumulated for use during the winter months, when navigation on the Saguenay is closed.

ABOVE:—Aluminum is used extensively in the construction of aircraft. Riveting an aluminum wing.

Courtesy Douglas Aircraft Co.





TOP:—Mine skips for use in the mining industry manufactured from aluminum.

Courtesy
E. Long, Limited

LEFT: — Rolling sheet aluminum.

Aluminum is used extensively for the transmission of electricity, practically all the high tension transmission lines in Canada having been "drawn" from this material.

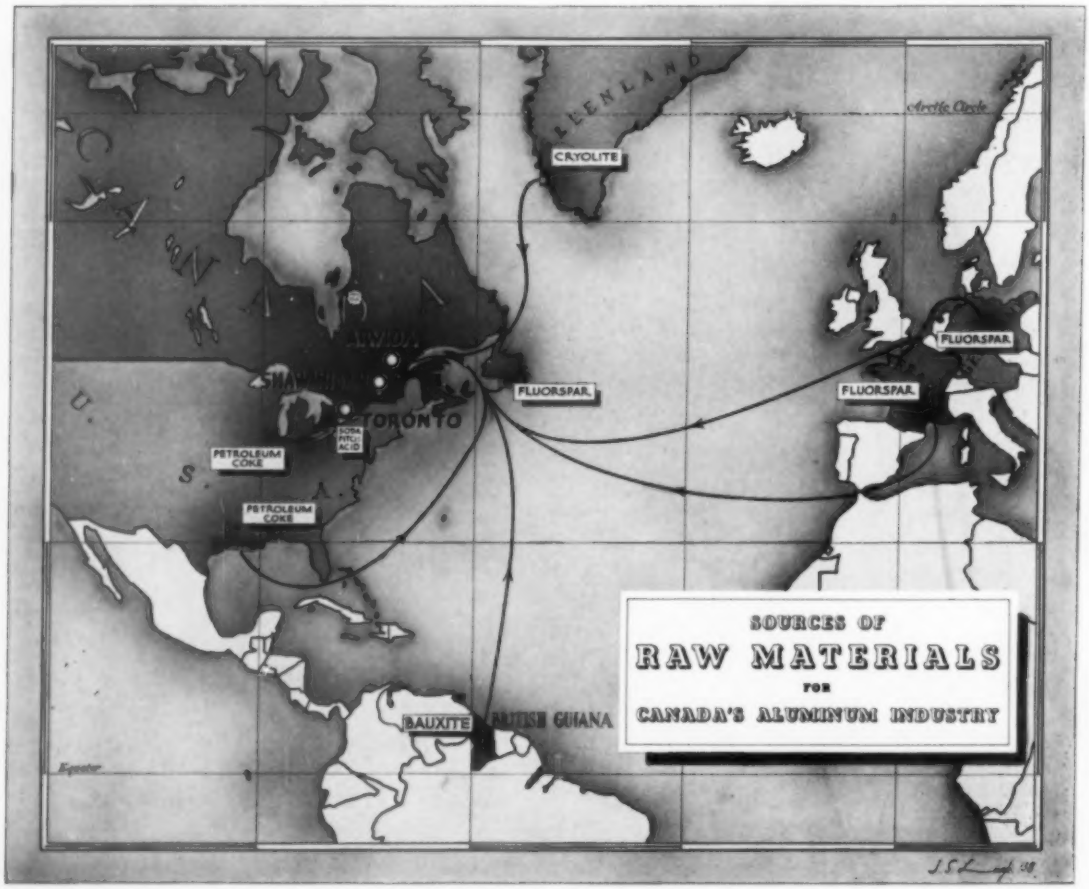
BELOW:—Dwellings of bauxite workers in Mackenzie, British Guiana.

Should the domestic market for strong-alloy products increase sufficiently, the Aluminum Company of Canada has indicated a willingness to build the necessary, large-capacity plants. However, it has been pointed out that, heretofore, the market has not offered any more business than would keep the fabricating facilities busy for more than about four weeks out of each year. Taxes and other overhead costs of maintaining plants continue steadily throughout the year and must be paid somehow. Then there is the still more important item of personnel. Skilled workers, versed in the technique of fabricating strong-alloy aluminum, cannot be obtained for the asking and, if they are to make a living, must have much more work than can now be promised them.

Foreign Markets Essential

As we have seen, Canada has no bauxite nor cryolite nor sufficient supplies of high-purity petroleum coke and fluorspar, with the result that these, as well as other raw materials, must be brought great distances to Arvida and Shawinigan Falls. Conversely, the Canadian market for aluminum is relatively small; for example, in 1937, the total Canadian consumption was only 12 per cent of Canada's existing capacity to produce. Accordingly, just as it is necessary to import the basic raw materials, so is it necessary to export the products. While this is essentially a problem for the producer, it is also one in which labour, transportation and power companies, and many suppliers of miscellaneous materials and services are interested. If it were not for the exports of aluminum, which in 1937 reached the record-breaking total of $18,623,475, many persons presently employed would unquestionably be without work.

If finding export markets depended upon pure economics, the problem would be greatly simplified. But, because of the intense waves of nationalism which have swept over many countries in the past decade or so, the matter cannot be lightly dismissed. When the aluminum industry was established in Canada, foreign tariffs

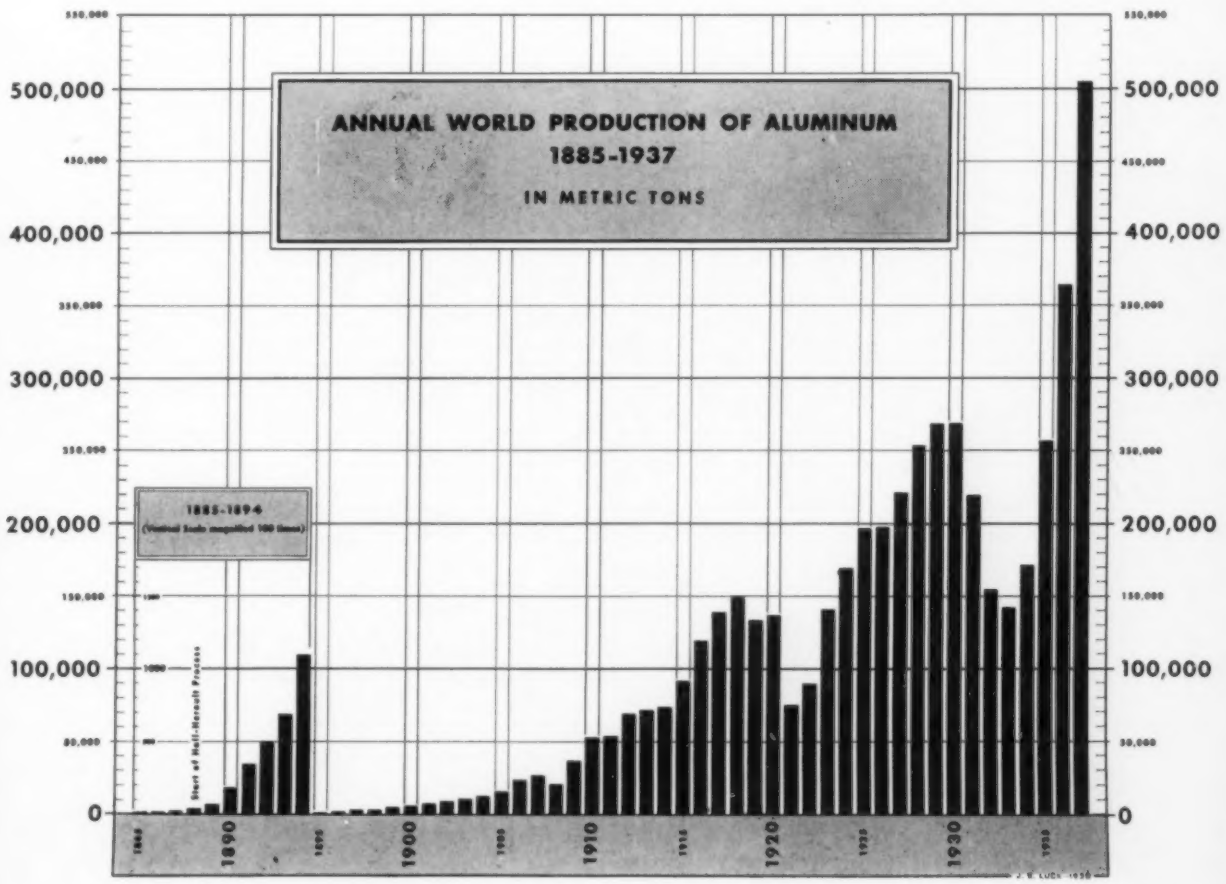


either were of no consequence or did not exist. Large expansions of the Canadian industry occurred based on this premise, if one may call it such, and there were very few other countries producing aluminum.

Take 1913, for example. The United States and France were the world's two most important producers, but these countries were—and still are—unique in that raw materials, power and markets all lay within their borders. Excluding Canada, the only other producing countries of note were Switzerland and the United Kingdom. Germany and Austria had insignificant production, and Norway and Italy, each with an output of only a few thousand tons a year, completed the picture.

Today, the situation is entirely different. Not only have tariffs been erected by totalitarian countries, but also quotas which have proved to be virtual embargoes. No longer is the marketing of aluminum purely an economic proposition. Smelters mushroomed in countries which never had production before—Russia, Sweden, Hungary, Yugoslavia and Japan fall into this category. Other countries, such as Australia, Belgium, Czechoslovakia, Rumania, Greece, Holland and India, are reported to be seriously considering the establishment of plants. Moreover, some countries, Germany and Italy for example, have increased production tremendously. Last year Germany alone had a greater output than all countries added together had ever produced up to two decades ago.

Thus, not only are foreign markets for the Canadian aluminum industry ever decreasing in number, but competition in those markets is becoming keener and keener because other countries in the same predicament as Canada, namely large exporters of aluminum, are also trying to sell there. A factor which aggravates this situation is that totalitarian nations sometimes sell their aluminum at almost any price below cost in order to get foreign exchange. This is possible because rigid economic control enables the loss to be borne by the nation as a whole rather than by a single company. Be that as it may,



fundamentally the aluminum industry is growing rapidly as more and more uses are found for the metal.

Main Markets in Empire

Today it would seem that the main markets for the Canadian aluminum industry lie within the British Empire. Canada, with vast quantities of low cost power, is advantageously situated with respect to raw materials as well as markets. Moreover, the Canadian smelters are far removed from possible areas of international strife, in addition to the fact that, per ton of metal desired, it is undoubtedly more feasible to transport only the metal itself into such areas rather than about seven tons of raw materials.

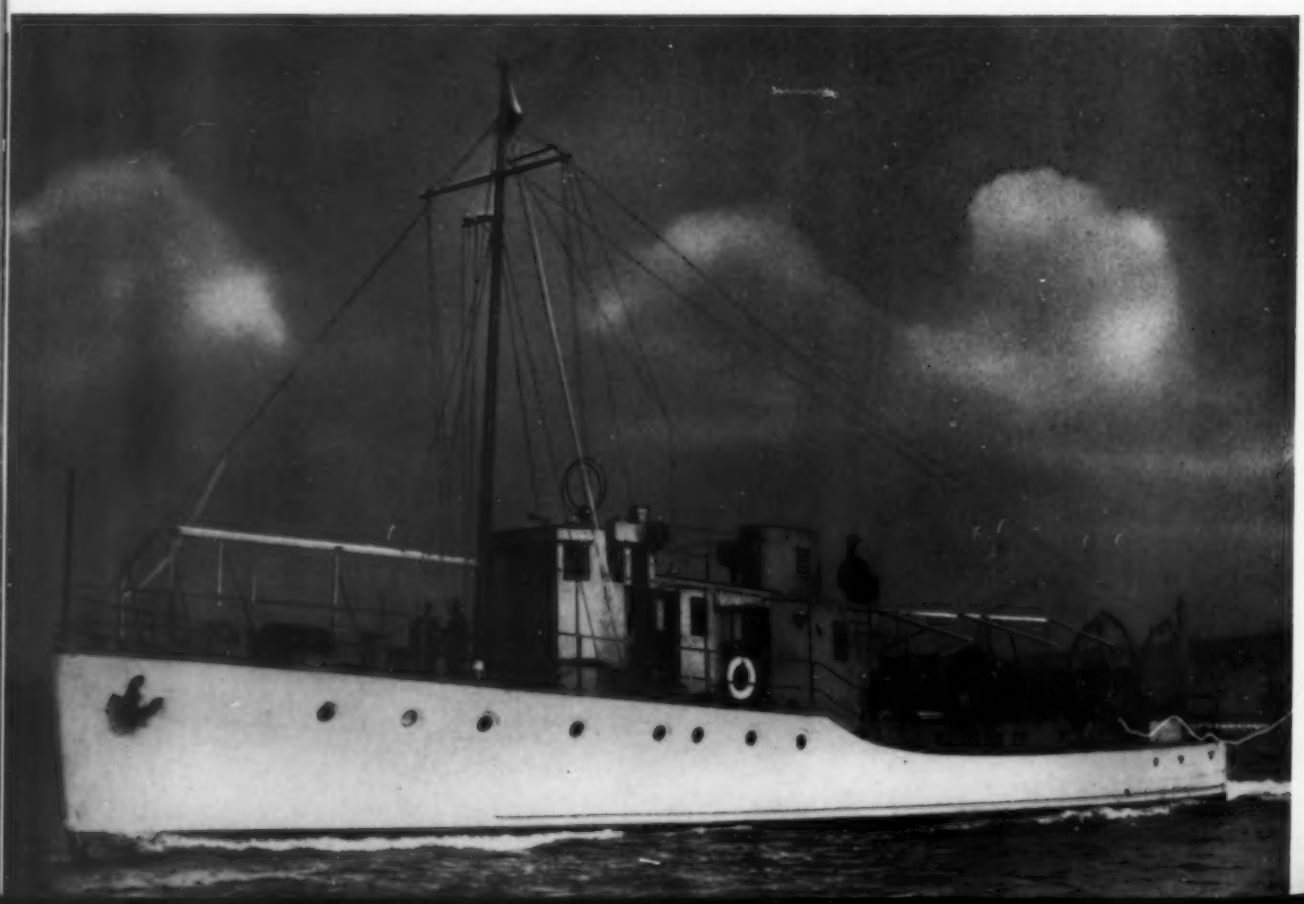
There are three producers of aluminum in the British Empire, namely: The British Aluminium Company, Limited, with smelters at Foyers Falls, Kinlochleven and Fort William, Scotland; the Aluminium Corporation, with a smelter at Dolgarrog, Wales; and the Aluminum Company of Canada, Limited, with two smelters in Canada. However, it is interesting to note that the Canadian company is not only by far the largest producer, but is also the only producer mining its own bauxite (through its subsidiary in British Guiana, the Demerara Bauxite Company, Limited) in a British country. Thus, that company presents a British Empire industry right from the mine through to the finished product.

We all know of Canada as a great producer of newsprint and wheat. We know, too, that Canada has mines yielding gold, nickel and copper in abundance. Accordingly, it is not surprising to find these commodities listed in that order by the Dominion Bureau of Statistics as Canada's most important exports. But it may be surprising to find that aluminum is the next metal. In other words, omitting gold because it is a precious metal, we find that aluminum ranks third in Canada's exports of common metals—a rather outstanding fact when it is remembered that Canada has no ore of aluminum.

Acknowledgment:—Photographs not otherwise credited were supplied through the courtesy of: Pringle & Booth, Ltd., S. J. Hayward, Canadian Airways Limited, C. J. Maier, Kryolith Mine og Handels Selskabet, A. C. Johnston, J. W. Lengbridge and Edwin C. Levick.

World-wide employment of Canadian aluminum is exemplified by the patrol vessel "Vigilant", built in Australia, the aluminum plates for the wheel house and chart room having been rolled from ingots smelted in Canada.

Photo by "The Sun", Sydney, Australia.



EDITOR'S NOTE BOOK

Miss Harriet Geithmann, a native of Wisconsin, is the writer of the delightful article dealing with the enchanting but little-known water ouzel, which appears in this issue. Miss Geithmann has travelled extensively and as a free-lance writer has made contributions to numerous national magazines revealing intimate glimpses of subjects as diversified as they are intriguing.

J. J. Plommer, who contributed "Tenquille Valley and Sun God Mountain", is a native of the county of Dorset, England, coming to Canada in 1903. Although a Chartered Accountant by profession Mr. Plommer took up geology as a hobby through association with mining and exploration enterprises and is now vice-president of the geology section of the Vancouver Natural History Society.

Christmas Issue

Readers of the Journal are reminded that orders for extra copies of the Christmas (December) number should be placed as early as possible to enable adequate provision to be made to meet their requirements. Provision has been made for the inclusion of two outstanding Canadian features and one foreign. All features will be profusely illustrated in black and white —with a twelve to sixteen-page section in *four colours*. Sir Robert Falconer contributes a comprehensive article entitled "Canadian Universities". Mr. D. W. Buchanan writes on the topical subject "Canadian Paintings" (illustrated in colour); and under the joint authorship of Messrs. C. Rasmussen and A. Gilbert Hale, "Norway" is vividly depicted. Readers desiring to present membership Christmas Gifts to friends at home and abroad may, on request, have such memberships commence with the Christmas issue, which will be off the press *December* 1st in order that gift copies may reach recipients in all countries by Christmas Day. Greeting cards are sent out by the Society in the name of the donors.

AMONGST THE NEW BOOKS

Portrait of Mexico, by DIEGO RIVERA and BERTRAM D. WOLFE (Toronto: McLeod, 1937, $5.25). It has been said that in Mexico there are literally acres of walls and ceilings covered with the murals of Diego Rivera. These world-famous murals and his prolific output of canvases have been reproduced in this book, which, with its two hundred and forty-nine plates, presents a unique interpretation of Rivera's native land, its people, its struggles and aspirations. Beginning with the Pre-Conquest Indian civilization of the Mayas, Aztecs, Tarascans and Zapotecas, he unfolds the tragic story of the conquest, its three centuries as a Spanish Colony, the stirring events of its history after it threw off the yoke of Spain, and concludes with a vision of the liberated Mexico of the future. Bernard Wolfe, distinguished writer and close student of Mexican affairs, has written an absorbing explanatory text, continuing a previous collaboration with Rivera in their very successful volume, *Portrait of America*.

Union Géographique Internationale. Compte rendu du Congrès (Warsaw: 1934, volume 3). The 14th International Geographical Congress was held in Warsaw in 1934. Its Proceedings have now been published, volume 3 appearing in 1937. This volume is devoted to human geography. The questions studied are: Man in the geographic landscape: the geographic types of colonies, emigration, acclimitation: the influence of the geographical environment on aerial communications and automobiles: urban geography: the localization of industries: geographical laws and their divisions: delimitation of regions in economic geography: the rural habitat: overpopulation in relation to geographic and regional conditions, many of them of vital importance in the light of recent events. The illustrations are abundant and very well executed. The larger part of the volume is in French.

The Old-time Maori, by MAKERETI, (London: Victor Gollancz, 1938, 16/). At one time Chieftainess of the Arawa tribe, and known in New Zealand as Maggie Papakura, the author has written about her own people so that we see the life of the Maori as it appears to one of themselves. Educated in Oxford, she was able to appreciate how precious were the customs and beliefs which she describes and to what extent the European culture had modified the native mode of life.

Social anthropology is dealt with in chapters on Social Organization and Relationship Terms, Marriage, and Children. Material Culture is described under the headings: Fire, Houses and Weapons. "There is no special section on Magic or Religion but constant references occur to *tapu* and *mana*, two fundamental magico-religious beliefs, and to Karakia, a kind of chant to the gods". T. K. Penniman, Secretary to the Committee for Anthropology in Oxford University edited the work and provides a delightful biography of Makereti. The book, which is copiously illustrated with photographs and with illustrations in the text, should be of special interest to anthropologists.

Swampy Cree Legends, being twenty folk-tales from the annals of a primitive, mysterious, fast disappearing Canadian race, as told to Charles Clay (Toronto: MacMillans of Canada, 1938,

$1.25). The Swampy Cree of Northern Manitoba became well known to Mr. Clay when he spent three years among them as a missionary teacher for the United Church of Canada. Impressed by their poetic outlook, their ingenuity and the fertile resourcefulness of the Indian mind in explaining the things of life about him, the author selected these twenty legends, which were told to him, (through an interpreter), by an old Indian grandmother. Kuskapatchees, the Smoky One, tells the tales of her people to Nosesim her grandchild.

One very notable peculiarity of the lore of the Swampy Cree is that there is a central character who appears in all their legends, Wesukechak. They say Wesukechak was a person who ived long ago. Some say he was the Creator of all things and call him the Great Spirit. Others refer to him as a super-man in an age of super-animals. The legends relate that he could do everything, and all over the Swampy Cree country they point to objects associated with him. By far the larger number of these stories treat of his activities in dealing with the birds and animals, punishing and rewarding them and acting as mediator between them. Those who have heard the Indians telling and retelling these ancient legends say that Mr. Clay has captured to an unusual degree the narrative style of the Indians themselves. The stories are full of charm and humour. One learns why there are shadows on the moon, the origin of the Wavey Goose, why the loon has a flat back, why the wolverine has stripes, and many other ingenious conceptions. Here is the concluding paragraph of "How the World was Made Again". "Then Wesukechak told the snakes to make rivers. And Mabeekun the Grey Wolf jumped about with his big feet in the soft earth and made hollows that formed lakes. And he pushed up big piles of mud with his nose and mountains were made. And Wesukechak ordered trees and grass to appear and they appeared, for he had the power. And that is how the world was made again". Following the preface (which should be read), is a key to the pronunciation and meaning of Swampy Cree names which one meets in the text. Children, especially will find this little book a delight.

Our Amazing Earth, by CARROLL LANE FENTON (Toronto: Doubleday, Doran and Co., $5.00). In this book Dr. Fenton presents to the American public a popular exposition of the geological history of the earth and more particularly of the continent

of North America. The author's style is easy and readable, and he has produced a book by means of which the layman and non-technical reader can obtain, at least a general picture of the forces and events which have produced the earth's surface as we know it to-day. The book is admirably illustrated with photographs and diagrams. Many of the photographs are, as the author says, of scenery and not geology, which emphasizes the fact that the two are in a way synonymous, and his explanations of the underlying causes of various types of country, are as a rule, clear and concise.

This book will be a pleasant introduction to geology for the general reader and will give to the traveller a better appreciation of American physiography. Possibly the arrangement of the book might be criticized in some details but it is difficult to cover so broad a subject in the short space of 300 pages without some confusion. Air photographs might with advantage, have been used to illustrate certain subjects and types of country which can be better shown in that way than by description or ground photography.

Canadian readers will be interested in the many excellent photographs of Canadian subjects and the references to Canadian geology and geologists. The book is amply indexed and the final chapter gives a reading list of books for the benefit of those who wish to delve further into this fascinating subject.

History of Prairie Settlement and "Dominion Lands" Policy by ARTHUR S. MORTON & CHESTER MARTIN (The Macmillan Co. of Canada, Toronto—Price $4.50). This book, volume two of the series "Canadian Frontiers of Settlement", is an exposition of the settlement of the Prairie Provinces of the Dominion and of the policies regarding the disposal of public lands, under which that settlement took place. It contains, with prefaces and index, nearly 600 pages and is illustrated with many charts, diagrams, and maps. On account of the small scale used some of the latter are not always easy to read.

It is apparent that this volume, like the companion books of the series, is not particularly intended for the general reader but rather for the student and for reference. Since, however, land settlement and land policy have for the last 70 years been so intimately associated with the whole life of these provinces, this book can almost be considered as a history of that period. The story of the various waves of settlement which converted, in the space of only one generation, the great buffalo range of the west into fertile farms and homesteads represents one of the most fascinating sections of Canadian history. The authors appear to have omitted no important phase of their subject but from the character of the book it has been necessary to base much of its contents on the official documents and in so doing it has perhaps failed to express that sense of pulsating vigour which was so characteristic of the periods of great activity in land settlement. Perhaps such a treatment was considered as being inconsistent with a scholarly study, but at the same time it is difficult to truly represent any phase of that period without taking largely into account the atmosphere created by the land-hungry hordes which swarmed into Western Canada from the four quarters of the globe. To this land-hunger is due much that, in the aftermath, can be criticized in the settlement

of unsuitable areas, and the resulting privations and hardship of which we have seen so much in the last few years.

This book represents a serious and comprehensive study of the subject. It is admirably indexed and documented, and will be of immense value to students of land and economic problems, both in this country and abroad. It should have a place on the bookshelf of every serious inquirer into Canadian history and affairs.

Letters in Canada, 1937, edited by A. S. P. WOODHOUSE, (Toronto: University Press, 1938, $1.00), is the third annual survey of Canadian literature which was originally contributed to the April and July numbers of the Toronto University Quarterly and reprinted in this useful volume. It presents a conspectus of the year's work in creative literature, in poetry, fiction and the drama, and places that work in its true setting in the social and cultural life of the communities that form the Dominion. Again, as in 1936, Poetry is dealt with by Professor E. K. Brown, Drama by W. S. Milne, Fiction by J. R. MacGillivray and the Remaining Material by Professor Woodhouse. "Remaining Material" covers a wide and important field, including arts and crafts in Canada, biography, critical essays, writings on religion, education and current affairs, history, language and literature, philosophy and general science, and the social sciences. In this section Dr. Woodhouse incorporates excellent brief reviews by experts from the University staff. These annotations and reviews make intensely interesting reading. The wide scope and variety of the work done during the year by Canadian writers is presented with amazing brevity while losing nothing in style and vigour, as criticism and comparison, analysis of plot and character-drawing, wise and witty discussion follow each other in rapid succession.

The survey of the literature of French Canada is once more admirably conducted by Felix Walter, whose opinion is that "only in the novel and in scholarship do English Canadians continue to lead the way. In every other genre French Canadians hold their own, and in some, such as the political essay and the higher branches of journalism in general, they leave us far behind."

The third part of the volume is an account of the work done by New Canadians, contributed by Professor Watson Kirkconnell of Wesley College, University of Manitoba. His introductory essay is an illuminating and sympathetic treatment of the growth in Canada during the last fifty years of at least a dozen lesser literatures in such languages as Icelandic, German and Ukrainian. Dr. Kirkconnell brings unusual qualifications to his exacting task, his studies in these untried fields having produced at least two notable books, "The Magyar Muse" and "The North American Book of Icelandic Verse." We are much in his debt also for the excellent bibliography of New Canadian Letters, which follows the exhaustive compilation of Alison Ewart for English Letters and Merle Storey for French Canadian literature.

The early appearance of this volume with its complete information, including the practical item of prices, should prove a boon to the many people who would choose Canadian books as Christmas gifts, but who lack the time and opportunity to appraise their value and make that judicious selection which renders "the very book" a delight to its recipient.

Hell on Ice, the Saga of the Jeannette, by Commander EDWARD ELLSBERG (Toronto: Dodd, Mead and Co., 1938, $2.75), bears a title which fittingly epitomizes this tragic voyage of nearly sixty years

ago. The Jeannette was sent by James Gordon Bennett of the New York Herald to discover the North Pole by way of Bering Strait. Commander DeLong hoped to reach the Pole either in a sea kept open by the Kiro Siwu current or by sledge journey over a vast Wrangel Land. Both hopes were disappointed, his ship was frozen in the icepack in September 1879, drifted westward and was crushed in June 1881 five hundred miles from the Lena Delta. By boat and sledge the ship's company set out for land, Melville, the engineer, and his party reaching a native village on the delta. Captain DeLong's boat landed on an uninhabited part of the coast and only two seamen survived. The third boat was lost with all hands.

Commander Melville wrote a brief account of this terrible journey in 1885 in his *In the Lena Delta*, another survivor, Lieutenant Dannenhower, in 1882 gave his *Narrative of the Jeannette* to the world and DeLong's journals, found near his body, were published posthumously in 1883 in *The Voyage of the Jeannette*. This story of human hardship and heroism, never fully known and almost forgotten has now been reconstructed by Commander Ellsberg from diaries, log-books and records of the court of enquiry into the disaster. He recounts it through the vivid personality of George Wallace Melville, chief engineer. It is a tale of incredible excitement and variety, of sudden disaster of desperate flight across the cruel ice, of perilous passage of stormswept Arctic seas to the barren frozen tundra of Siberia. A well-known Arctic explorer recommends it as a vivid and accurate story which gives merit where merit is due, and does not spare the weaklings and faint-hearted among the ship's complement. He adds "DeLong emerges as the good leader that he proved to be even if he was an indifferent judge of men. Ellsberg might have indicated that DeLong's failure was not altogether in vain. It was he who proved the transpolar drift on which Nansen later relied successfully and it was he also who exploded the conception of an Arctic continent."

The Story of Alaska, by CLARENCE L. ANDREWS, (Toronto: Copp Clark, 1938, $4.00). The author of this interesting account of Alaskan history has known that country since 1892 and has, in the course of many years newspaper work, written numerous articles describing the territory and its resources. He obviously has a great love for it and a firm belief in its future possibilities. Mr. Andrews accompanied the Italian party of the Duke of Abruzzi on its successful ascent of Mt. St. Elias in 1897. He was Deputy Collector of Customs in Alaska for twelve years, serving in Skagway for seven years during the great Klondike Stampede. For two years he engaged in the work of the Bureau of Education at Wainwright near Point Barrow. He dug for gold at Nome and lived on the Yukon River for two more years. He resided at Sitka when studying the Russian language, translating its historic books, and making a special study of the period of Russian control, from its discovery in 1741 to the time of its transfer to the United States in 1867. His long residence in the country and wide experience have given him unusual qualifications to write this detailed and accurate history of Alaska. Its text is supported by fifty pag s of well arranged notes of authorities and references. It will be a general source book of information for all who are interested in the life and development of this territory.

F. E. FORSEY.

CANADIAN URANIUM PROVIDES COLOUR AGENT FOR CERAMIC INDUSTRY

Ottawa, Canada.—Canada is now an important source of uranium, which has long been used by the ceramic industry, both on this continent and abroad, as the colouring agent in the production of certain shades of yellow and deep orange in glazes and glass. Uranium is obtained as a by-product in the processing of radium from pitchblende, and it was not until after the discovery and development of rich deposits of pitchblende in the Great Bear Lake area, N.W.T., and the erection of a refinery at Port Hope, Ont., by the Eldorado Gold Mines Limited, that Canadian uranium entered world markets, which previously had been supplied almost entirely by Belgian producers.

In the extraction of radium from pitchblende concentrates, large tonnages of uranium in the form of sodium uranate and black oxide of uranium are now produced at the Port Hope refinery. Sodium uranate is usually marketed in two forms, one called "yellow" and the other "orange". For the production of yellow shades in glass the yellow sodium uranate is usually used, while for the production of the deep orange shades in glazes, the orange sodium uranate is generally preferred.

During the early stages of development the production of uranium salts that would meet market competition from other sources presented a serious difficulty to the Eldorado Company. However, this and other incidental problems which arose in connection with the introduction of Eldorado sodium uranate (both orange and yellow) into the ceramic field were successfully solved in co-operation with laboratory workers of the Department of Mines and Resources, with the result that uranium products from Canada's Northwest Territories mine are now satisfactory in all respects for use in the ceramic trade.

In recent years the popularity of the bright orange colour obtainable by the use of uranium in the manufacture of such articles as so-called bungalow tableware, faience tile, terra cotta, stoneware (jugs and bowls) and art pottery has created a very attractive market in the United States and Europe for uranium compounds. Uranium salts now command a price of well over one dollar per pound, and the Canadian production of uranium products now runs into hundreds of thousands of pounds a year. The entire Canadian output is mined about forty miles south of the Arctic Circle and is transported more than 3,000 miles to Port Hope, Ont., for refining.

CANADIAN REINDEER INDUSTRY GROWING

Progress reports on the fawning of Canada's reindeer herd, just received by the Department of Mines and Resources, Ottawa, reveal that approximately thirteen hundred fawns had been added to the herd at the end of the first week of May. Fawning began about the first of April and was expected to continue until about the end of May. Complete figures will not be available until the July round-up, but a marked increase over the 1,181 deer born last year is indicated.

The herd has shown steady growth since the original 2,370 reindeer were delivered to the reindeer station in the Mackenzie Delta area in 1935. Notwithstanding the usual losses incidental to reindeer herding, and the annual slaughter of surplus stock (steers and aged females) to provide food and clothing for local needs, the deer numbered more than four thousand at the last round-up. The animals as a whole have adapted themselves to the climate and local conditions on the reservation, and the herd has now developed to the stage where extension of the reindeer industry in the interests of the Eskimo population is receiving serious consideration.

Several Eskimos have been in training with the government herd, but it is now proposed to establish a native herd and to increase the opportunities for the younger natives to learn reindeer husbandry. The plan being considered at present is to separate eight or nine hundred deer from the government herd and place them in charge of two native families under the supervision of a government officer. These deer would then be regarded as a native herd distinct from the main herd, and would be moved gradually eastward in the general direction of the Coppermine River, their ultimate destination to be determined later. It has been suggested that they spend the first year at least in the vicinity of Anderson River, about one hundred miles east of the Reindeer reservation, where a preliminary investigation has indicated that conditions generally are suitable for the herding of the animals.

Although the natives who may be entrusted with the management of a reindeer herd will be largely responsible therefor, the deer will remain the property of the government on the understanding they are loaned and that a herd of corresponding size and condition must be returned eventually. This arrangement would permit the natives to secure ownership of the natural increase which may result from the care the animals receive. Such native deer would also be subject to revert to government ownership if not properly herded.